SUPPLEMENT.

The Mining Journal,

RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

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No. 2523.—VOL. LIII. LONDON, SATURDAY, DECEMBER 29, 1883. PRICE (WITH THE JOURNAL) SIXPENCE BY POST £1 4s. PER ANNUM.

R. HUDSON'S

Patent Steel Trucks, Points and Crossings,

PORTABLE RAILWAY, STEEL BUCKETS, &c., &c.

Telephone No. 14.
In connection with the Leeds Exchange, and all the principal Hotels and places of business in the town.

GILDERSOME FOUNDRY, NEAR LEEDS.

(Near Gildersome Station, G.N.R. Main Line, Bradford to Wakefield and London, via Laisterdyke and Ardsley Junctions.)

Registered Telegraphic Address:—
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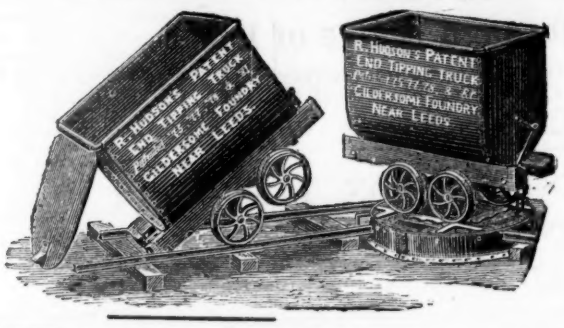
UPWARDS of 25,000 of these Trucks and Wagons have been supplied to the South African Diamond Mines; American, Spanish, Indian, and Welsh Gold, Silver, Copper, and Lead Mines; Indian and Brazilian Railways, and to Railway Contractors, Chemical Works, Brick Works, and Coal and Mineral Shippers, &c., &c., and can be made to lift off the underwork, to let down into the hold of a vessel, and easily replaced. They are also largely used in the Coal and other Mines in this country, and are the LIGHTEST, STRONGEST, and most CAPACIOUS made, infinitely stronger and lighter than wooden ones, and are all fitted with R. H.'s Patent "Rim" round top of wagons, requiring no rivets, and giving immense strength and rigidity. End and body plates are also joined on R. H.'s patent method, dispensing with angle-irons or corner plates.

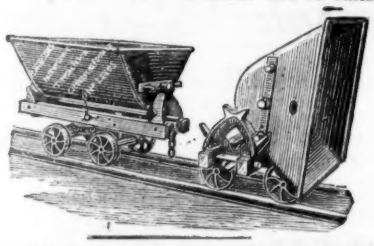
Patented in Europe, America, Australia, India, and British South Africa, 1875, 1877, 1878, 1881, and 1883.
N.B.—The American, Australian, Indian, and Spanish Patents on Sale.

CAN BE MADE TO ANY SIZE, AND TO ANY GAUGE OF RAILS.

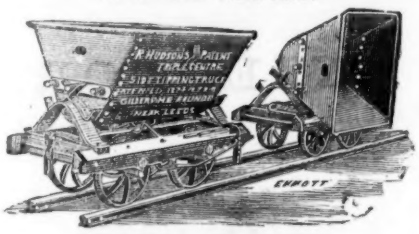
1.—PATENT STEEL END TIP WAGONS.



2. PATENT UNIVERSAL TRIPLE-CENTRE STEEL TIPPING TRUCK,
Will tip either SIDE or either END of rails.



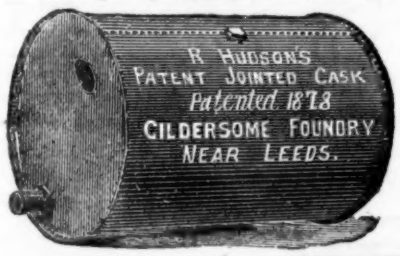
3.—PATENT TRIPLE-CENTRE STEEL SIDE TIP WAGONS.



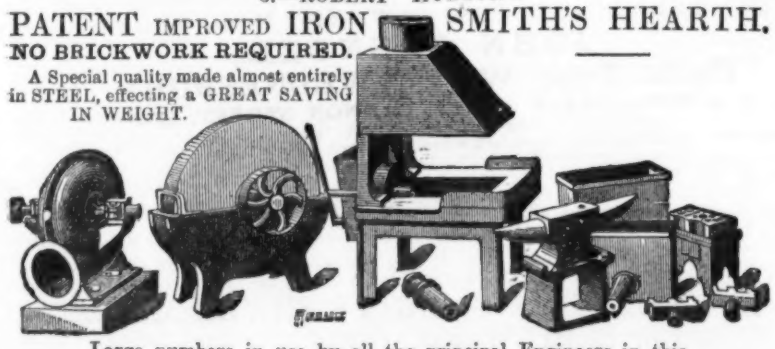
One man can EASILY tip ANY WEIGHT in these wagons.

4.—PATENT STEEL PLATFORM OR SUGAR CANE WAGON.

5.—PATENT STEEL CASK.
As supplied to H.M. War Office for the late war in Egypt).
DOUBLE the STRENGTH of ordinary Casks without any INCREASE in weight.
(Made from 10 gals. capacity UPWARDS to any desired size.)

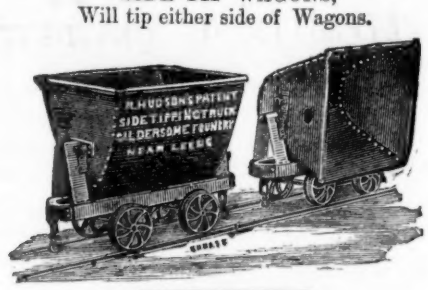


6.—ROBERT HUDSON'S
PATENT IMPROVED IRON SMITH'S HEARTH,
NO BRICKWORK REQUIRED.
A Special quality made almost entirely in STEEL, effecting a GREAT SAVING IN WEIGHT.

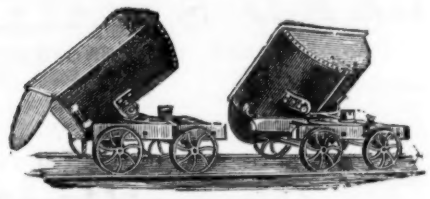


Large numbers in use by all the principal Engineers in this country and abroad.

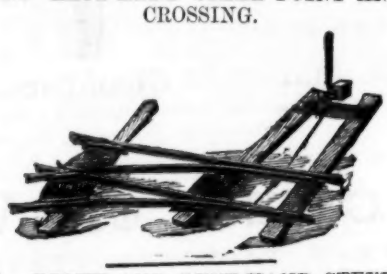
8.—PATENT DOUBLE-CENTRE STEEL SIDE TIP WAGONS,
Will tip either side of Wagons.



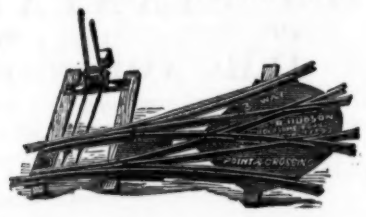
9.—PATENT STEEL ALL-ROUND TIP WAGON.



10.—LEFT-HAND STEEL POINT AND CROSSING.



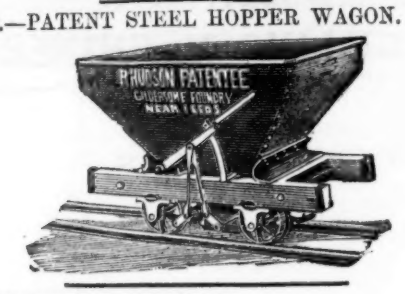
11.—RIGHT AND LEFT-HAND STEEL POINT AND CROSSING.



7.—PATENT STEEL MINING WAGONS.

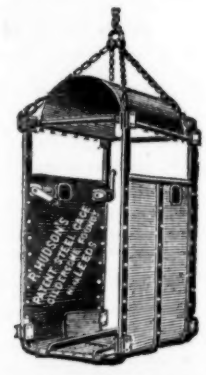
12.—PATENT STEEL HOPPER WAGON, WITH BOTTOM DOORS.

13.—PATENT STEEL HOPPER WAGON.



14.—SELF-RIGHTING STEEL TIP BUCKET.
(The "CATCH" can also be made SELF-ACTING if desired.)

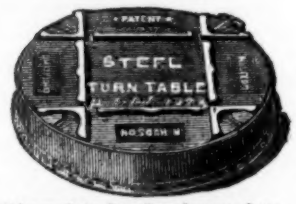
15.—STEEL CAGE.



16.—PATENT STEEL WHEELBARROWS.
Made to any Size.
Lightest and Strongest in the Market.

A great success.

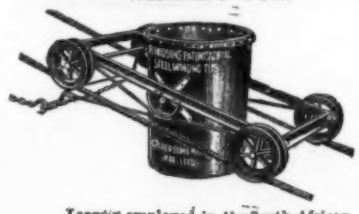
17.—STEEL SELF-CONTAINED TURNTABLE.



(Also made in CAST IRON for use where weight is not a consideration.

No. 19.—PATENT STEEL CHARGING BARROW,
DOUBLE the STRENGTH & much LIGHTER than ordinary Barrows

18.—"AERIAL" STEEL WINDING TUB.



Largely employed in the South African Diamond Fields.

ALL KINDS OF BOLTS NUTS, AND RIVETS MADE TO ORDER ON THE PREMISES

BELL'S ASBESTOS.

BELL'S PATENT ASBESTOS BLOCK PACKING, for High Pressure Engines. This Packing has been specially designed to overcome the difficulties experienced by engineers and others in the practical working of engines of the most modern type of construction. The greatly increased skill and workmanship now obtained in the construction of engines and boilers have led to a rapid increase in the working pressure, the object being the attainment of a high rate of speed combined with economical working, the practical advantage of which, however, cannot be realised unless the Packings are so constructed as to avoid stoppages for the purpose of re-packing the stuffing boxes.

It is now a recognised fact that the most perfect heat-resisting material suitable for the purpose of a Packing is Asbestos, but to ensure a successful application of this fibre, great skill is required in its selection and manufacture. In this Packing the Asbestos is woven into a stout cloth, and owing to the peculiar way in which it is manipulated, great elasticity is imparted to the Packing. So successfully has this been done, that with light screwing, it has been found in practice that little or no lubricant is required to ensure a minimum amount of friction, and to keep the rods from over-heating. An improved vacuum is always maintained by the use of this packing, which meets with unqualified approval wherever it is applied.

The Patent Block Packing is square, as Fig. 1. and Figs. 2 and 3 represent the Round Block Packing with solid and hollow rubber core, and Fig. 4 without core, but with rubber inlaid.

An Engineer writes as follows:—"The Asbestos Block Packing works splendidly. I have never seen its equal. We keep our gland nuts so that you can move them with finger and thumb, and can maintain a constant vacuum of 28½ in."

As these packings are extensively imitated, and as it is a common practice among dealers and agents to supply the cheaper manufactures at my list prices, users are requested to see that the packing supplied to them bears my trade mark.

TRADE MARK.

To avoid spurious imitations, and to secure the receipt of genuine goods, all orders should be sent direct to the under-mentioned addresses, and not through Agents or Factors.

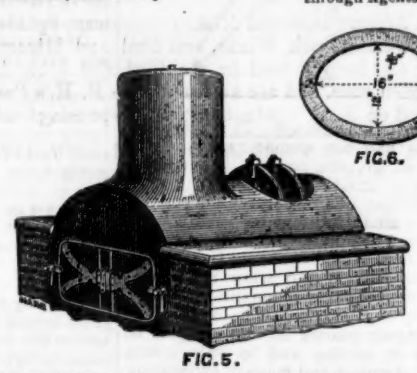


FIG. 5.

FIG. 6.

FIG. 1.

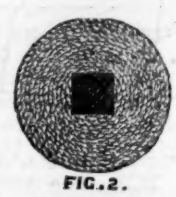


FIG. 2.

FIG. 4.

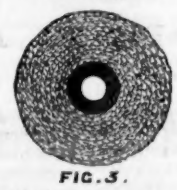


FIG. 3.

BELL'S ASBESTOS BOILER & PIPE COVERING COMPOSITION, for coating every class of steam pipes and boilers, non-combustible and easily applied when steam is up; adheres to metals and preserves them from rust; prevents the unequal expansion and contraction of boilers exposed to weather; covers 50 per cent. more surface than any other coating, and is absolutely indestructible. It can be stripped off after many years' use, mixed up with 20 per cent. of fresh, and applied again. The composition is supplied dry, and is only to be mixed with water to the consistency required for use.

A Horizontal Boiler, 17 ft. 6 in. long, 15-H.P., gave the following results:—

Temperature on Plates - - - 186 deg.
" " Covering - - 94 deg.

1 ton of coal was saved per week, and although the fire was raked out every evening, 20 lbs. of steam were found in the boiler next morning.

The following Testimonial refers to this Covering:—

Offices of the Wimbledon Local Board, Wimbledon,
Dear Sir,— Nov. 28th, 1883.

It may interest you to know that we save exactly 40 per cent. in fuel through using your covering.

Yours truly,
W. SANTO CRIMP, C.E., F.G.S.

BELL'S ASBESTOS and INDIA-RUBBER WOVEN TAPE and SHEETING, for making every class of Steam and Water Joints. It is the most efficient material for making bilge water pipe joints. It can be bent by hand to the form required without puckering, and is especially useful in making joints of manhole and mudhole doors; also for large "still" joints where boiling fat and steam have to be resisted. It is kept in stock in rolls of 100 ft., from ⅛ in. (Fig. 6) to 3 in. wide, and any thickness from 1/16 in. upwards. Manhole covers can be lifted many times before the renewal of the jointing material is necessary.

The same material is made up into sheets about 40 in. square, and each sheet bears my Trade Mark, without which none is genuine.

BELL'S ASBESTOS YARN and SOAPSTONE PACKING for Locomotives, and all Stationary Engines running at very high speed with intense friction.

The following Testimonial refers to this Packing;—

Festiniog Railway, Locomotive Superintendent's Office, Portmadoc,
Mr. John Bell, 118, Southwark-street, S.E. January 13th, 1883.

Dear Sir,—I have much pleasure in saying that the Asbestos Yarn and Soapstone Packing gives every satisfaction; indeed better than we expected. We have a locomotive packed with it, which has been running five months (and think of the piston speed with our small wheels). I think the Soapstone a great improvement, as it keeps the packing elastic, and prevents it getting hard. I am very pleased with its working, and also the very low price for such good lasting Packing. The Asbestos Yarn we find is very useful, and answers admirably.

Yours truly, (Signed) W. WILLIAMS.

Every 10 ft. length of Bell's Asbestos Yarn and Soapstone Packing bears a special label with the Trade Mark, and engineers are earnestly requested to see that this label is attached, to prevent imposition by worthless imitations.

Mr. John Bell, 118, Southwark Street, S.E. Sewage Works, Winchester, Nov. 1st, 1883.

Dear Sir,—I have much pleasure in informing you that I have used your Asbestos and India-rubber Woven Sheeting and Tape with great satisfaction. Some of the Tape has been in use nearly 12 months on the pump cover joints, and situated as I am where there is no storage for the sewage, always obliged to keep one engine running, the facility and great saving of time in taking up a cover jointed with your Tape is a very important consideration.—Yours truly, J. ASHCROFT, Chief Engineer.

It is very necessary to guard against imitations of this useful material, and to secure themselves against being supplied with articles of less value at my price, users are recommended to see that every 10 ft. length of the Asbestos Tape purchased by them bears my Trade Mark.

BELL'S SPECIAL LONDON-MADE ASBESTOS MILLBOARD, for Dry Steam Joints, made of the best Asbestos fibre, is well-known for its toughness and purity, and is absolutely free from the injurious ingredients frequently used to attain an appearance of finish, regardless of the real utility of the material. Made in sheets measuring about 40 in. square, from 1-64th in. to 1 in., and ½ millimetre to 25 millimetres thick. Each sheet bears my Trade Mark.

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The California pattern of Gold Stamp Mill is universally accepted as the most perfect, economic, and efficient made.

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Silver amalgamation in Pans is essentially an American system evolved after years of work on the rich silver mines of Nevada.

We have over 500 Stamps, with necessary pans, settlers, roasting furnaces, &c., all of our own manufacture, at work in different silver camps of the United States, Mexico, and South America, and Phillipine Islands, Asia.

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Of the most approved German pattern and arrangement, or with Stamps and Frue Vanner Concentrators for low grade silver ores, light in lead. We have over 20 large German pattern mills at work on lead, zinc, or copper ores, and numerous Vanner mills on ores never before successfully concentrated.

Mining Pumps, Cornish pattern, of the largest sizes. **Hoisting Engines,** from 4 h.p. up to the largest direct-acting engines to sink 3000 feet.

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We have 80 Water Jacket Smelting Furnaces in use from 20 in. circular up to 54 in. by 60 in. for lead and silver smelting; and special High Jacket Furnaces for copper ores.

Engines of any size, plain slide valve, Corliss, compound Corliss, Boilers, all sizes. **Leaching Mills, Hallidie Wire Rope Tramways. Comet Crusher,** with capacity of 12 to 20 tons per hour. **White, Howell. Bruckner, and Stetefeldt Roasting Furnaces, &c.**

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Having visited all the richest Gold Centres in the World, has several VALUABLE GOLD MINES FOR SALE.

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Special Rock Drill Steel.

Mining Tools, Files, Saws, Hammers, and Picks.

CANNON STEEL WORKS, SHEFFIELD.

The Only Knapping Motion Stone Breaker and Ore Crusher.

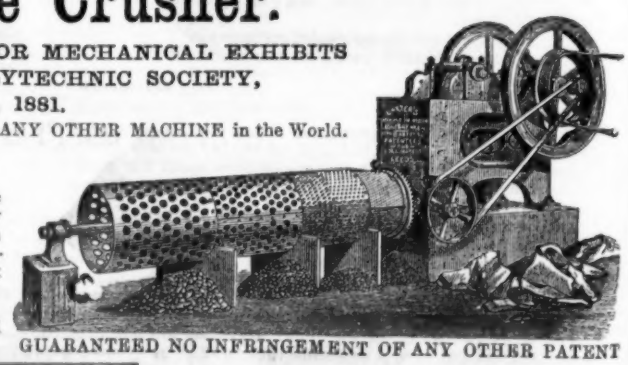
AWARDED THE ONLY SILVER MEDAL FOR MECHANICAL EXHIBITS AT THE ROYAL CORNWALL POLYTECHNIC SOCIETY, FALMOUTH, SEPT., 1881.

UARANTEED to do MORE WORK with less power THAN ANY OTHER MACHINE in the World.

NOTE THIS FACT.

To Mr. Baxter, Leeds. *Cinderford, Feb.* 13, 1883.

Dear Sir,—I am pleased to be able to tell you that the Machine works splendidly. We are breaking 16 trucks a day now, and we thought it a good day's work to do 10 a day with the old Machine, so you can see the difference. I had a gentleman looking at it yesterday, and he was surprised to see it work so easily. Yours truly, E. ORGAN.



The above refers to one of our 16 by 9 Machines we supplied to replace an "Improved Blake" 15 by 9 Machine.

GUARANTEED NO INFRINGEMENT OF ANY OTHER PATENT

AWARDED THE ROYAL MANCHESTER, LIVERPOOL, AND NORTH LANCASHIRE AGRICULTURAL SOCIETY'S SILVER MEDAL, 8TH OF SEPTEMBER, 1882.

FOR ILLUSTRATED CATALOGUE AND FULL PARTICULARS ADDRESS TO THE PATENTEES AND SOLE MAKERS,

W. H. BAXTER & CO., ALBION STREET, LEEDS.

PRACTICAL MINING—THE DIAMOND DRILL CLINOMETER.

Fig. 3.

Fig. 10.

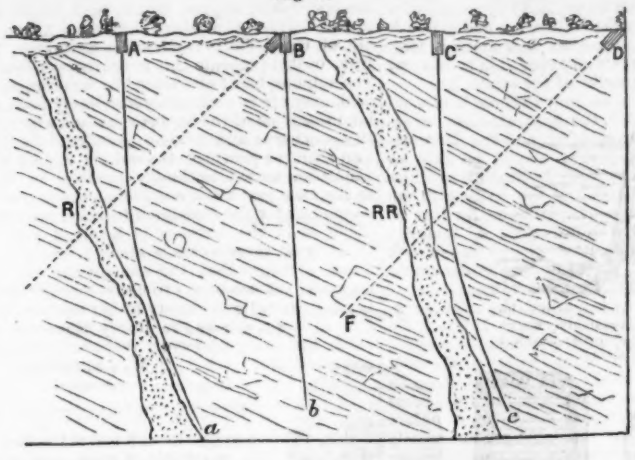
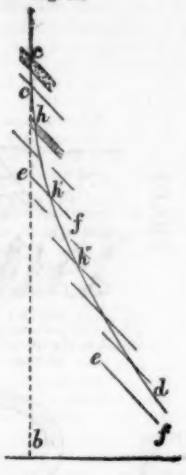


Fig. 11.



PRACTICAL MINING—THE DIAMOND DRILL CLINOMETER.

SIR,—In your Journal which reached here by the last mail I observe a short descriptive reference to a very valuable and newly-invented clinometer; but, unfortunately, "Maori," who sent you the description, omitted to state that its main use is for discovering the deviations of Diamond drill bores from the vertical or horizontal, &c. By this beautiful instrument the directions of bores can be as accurately surveyed as shafts, levels, &c. It was presumed that Diamond drill bores were always bored straight, but experience has proved to us here in Victoria that a bore-hole approaching the straight is an expection, and crooked bores the rule. Much money has been lost in seeking for "reefs" cut by bores, and great disappointment felt through the want of success in finding bores. In the Scotchman's United Mine, Stawell, had this Diamond drill clinometer been used at first the proprietors would have been saved 2311*l*. This is but one proof of many that I might quote of the intrinsic value of Mr. Macgeorge's invention. As this instrument is a local invention, and not likely to be known to your readers, I subjoin an abridged description of it, with illustrations, by which it will be noticed that it is as well adapted for scientific deep sea soundings as for Diamond drill bores.

Exchange, Melbourne, Oct. 24. WM. NICHOLAS.

In a paper "On the Patent Bore-Hole Test, or Clinograph," by Mr. E. F. Macgeorge, read before the Victorian Institute of Surveyors on Sept. 1, the author stated that the common belief in the capacity of Diamond drills to bore a straight hole through hundreds of feet of strata of varying densities, and standing or lying at every possible angle to the line of bore, has during the past year or two received a rude shaking. At various places, and notably at Sandhurst and Stawell, where costly operations were in several instances rendered necessary by a mistaken confidence in the rectitude of drills, the bores made by these instruments were found to have deviated so seriously from their initial directions as to imply errors amounting to from 30 to 80 ft. in bore-holes of 500 ft. In fact, wherever a drill has touched payable stone, and wherever the results, therefore, have been mined for, as in Victoria, the search for them has been protracted, bewildering, and expensive; and in every case the bore-hole and the mineral deposits touched by the drill have been found at a considerable distance from where they should be. Hence the unpopularity of Diamond drills among those who stand most in need of their assistance in prospecting, and hence the necessity of devising some method of detecting their deviations, and of turning their vagaries to useful account by reducing them to rule and measure.

It would be tedious to recount the various schemes which have been suggested and tried during long months of painful, unsatisfactory, and costly exploration in hard and refractory country for the discovery of lost bore-holes. Sounding, tapping, and scraping in the bore, even if close at hand, are very faintly heard, and owing to irregular veins and fissures are very misleading. At 20 ft., or even at a less distance, they are inaudible in the exploring levels or shafts. Methods by infiltration of chemicals, by hydraulic pressure, by magnetic action, by electrical resistances between bore-hole and drives, were (as in the case of the Scotchman's United Mine, for example) suggested and rejected in succession, and there were serious thoughts of abandonment of the search, when the writer, struck with the gravity of the situation, devised a simple, yet effective, means of making what may be termed a survey of the bore-hole from its origin.

Clear glass phials, nearly filled with a hot solution of gelatine, and each containing a magnetic needle in suspension, free to assume the meridian, were encased in a brass protecting tube and let down to the depth required, being allowed to remain for several hours until the gelatine had set. On withdrawal the phials could each be replaced at the same angle at which they had cooled, by means of the congealed surface seen through the sides of the phial, and which should be brought horizontal. Revolving the phial upon the part where the magnetic needle was seen embedded in the gelatine until the needle again was in the meridian, the phial was in the same position as it was in the bore-hole, both as to inclination and azimuth, and thus the gradient and bearing of the bore-hole at that part was known and measured. The mean of the several phials would give a still more accurate result. By repeating this operation, say at every 50 ft. of the depth of the bore-hole, its exact course may be mapped, and the exploring drive or shaft can be with certainty directed to any spot which the drill has touched. Such is the device which was first brought into use in the Scotchman's United Mine, at Stawell, and which was so effectual as to enable the bore-hole to be found shortly afterwards, although 37 ft. away from its supposed position, at 370 ft. in depth, or 80 ft. in 500 ft., the full depth of the bore. Subsequent trials were made with the same apparatus in the Crown Cross United Mine, at Stawell, before commencing the intended drive towards a reef pierced by the Diamond drill, and the drive being altered to intercept the real course of the drill, which was 18 ft. away from the straight, intersected it fairly in the middle of the drive, and exactly in the direction indicated by the Test.

As the indications of the congealed surfaces within the phials were found to be unsatisfactory, owing to the effects of capillarity and unequal adhesions to the sides of these cylindrical vessels, as also to the action of unequal refractions through the glass, the inventor determined to adopt another expedient by which a perpendicular line or plummet, free during liquidity and fixed on congelation of the solidifiant fluid used, was substituted for the horizontal surface indication. At the same time the magnet was rendered far more delicate and reliable in all possible inclinations of bore-hole, and the form of the phial was finally determined.

The present phial or *clinostat* is a true cylinder of glass, as to its central part or barrel *B* so as to fit, when enclosed in a brass "jacket" or sheathing accurately within a brass guide-tube or *geoscope*. At the lower end the phial terminates in a short neck and a bulb (L), within which a magnetic needle (*N S*) is semi-floated under the buoy *F*, so as to stand upright upon its pivot (*p*) like a top upon its peg, in every position of the phial, and thus allow the needle, *N S*, which is fixed upon *p*, to assume the meridian freely at all times without touching the sides of the hollow bulb L. Passed through an air-tight stopper (*a a*) at the upper end is a small glass tube (*t t*), terminating in another bulb (I) above, and with its open lower end (*t*) inserted in a stopper (*r r*) which enters the lower neck of the phial, and thus prevents the escape of the needle and float already mentioned as occupying the lower bulb.

The upper bulb (I) contains a delicate plummet of glass, consisting of a fine rod (*l b*) terminating in a plumb (*b*) of solid glass below, and in a diminutive bulbous float (*l*) of hollow glass above. A delicate grating in the neck (*g*) prevents its escape. It is very carefully adjusted to a fraction less than the specific gravity of the solidifying fluid (*fl fl fl*) in which it, like the magnet, is immersed, and then its poise is so adjusted as to ensure that the rod or shaft (*l b*) shall be truly in the perpendicular line, whatever the position of the phial and bulb in which it is contained may be. While fluid, the contents of the clinostat *fl* (which completely fill both upper and lower bulbs), permit the plummet to float plumb, in the centre and barely touching the top of its chamber (I) and allow the needle (*N S*) to assume with the utmost delicacy the magnetic meridian; but when the phial is at rest, in any position, from vertical to horizontal, and pointing to whatever quarter of the compass as it inclines, the contents solidify in cooling, and by this means grasp and hold fast the indicating plummet and magnet, embedding them, like the "fly in amber," in firm, transparent substance. The fluid then contains within itself an automatic registration of the inclination and azimuth at which its containing vessel cooled, while, let us say, 500 ft. deep in the bore-hole to be tested; and it is easy therefore, after its withdrawal, to tilt it to the same angle and to the same quarter of the compass as before, by simply bringing the embedded plummet and needle to the vertical and the northerly directions respectively. The term *clinostat* designates clearly the incline-stereotyping phial just described. The whole contrivance is in principle, indeed, simplicity itself; but the reduction of these principles to practice, owing to the extreme delicacy of manufacture requisite to obtain reliable results, and to the incredible difficulties in the way of obtaining intelligent, accurate, and delicate workmanship in glass, in a colony where this trade is in its earliest infancy—difficulties which eventually drove the inventor to become his own manufacturer—proved, indeed, a work of time, of ceaseless expenditure, and of patience. Some minor details, doubtless, could be, and will be, still improved, chiefly in the direction of durability and convenience of application; but the indicating parts themselves are, it may be safely said, more delicate and accurate in their automatic registration than the ordinary conditions of mining survey are likely to require, and will enable inclinations and azimuths to be observed within a very small fraction of a degree, by the use of another part of the apparatus called the clinometer, or recording instrument.

If we could introduce a theodolite into a bore-hole, together with an observer to record the angles, vertical and horizontal, there would be no need of this part of the invention. But, as the ordinary bore-hole is less than 2 in. in diameter, although 500 ft. in depth, we could at the best only put the telescope-part of the instrument down to the desired distance. Let us suppose that such a telescope by some magic had the power when restored to its place in the theodolite of replacing itself at the same altitude, and of looking to the same quarter of the compass as when down in the bore-hole, then we should have nothing to do but read the graduated circles as if we were making a direct observation, and note them. The clinostat already described is just such a magic telescope, and when placed in the recording instrument is readily set, by means of the imprisoned plummet and magnetic needle, in the same direction, both as to altitude and azimuth, which it had previously assumed while in the bore-hole, and far withdrawn from the observer's eye and control. The *modus operandi* is as follows:—The clinostat with its congealed contents is placed in a sheath of brass tubing, which we may term the cradle, attached to a movable arm, which carries the index of the vertical arc. This sheath or cradle corresponds with the Y's of a theodolite, and carries the phial firmly upon the same principle as these carry the usual telescope. The upper bulb (I) of the clinostat is brought into the field of two cross-visioned telescopes, which are carried with the arm round the vertical arc, and which are kept truly in the same plane at every angle of inclination by a parallel motion. There are vertical lines drawn upon the concave object-glass of each telescope, which, of course, are kept truly perpendicular by the parallel motion just mentioned. The clinostat is revolved in its cradle, and the arm is moved along the arc by a tangent-worm until the embedded plummet (I) is made perpendicular from each point of view or parallel with the vertical lines of reference just described, as viewed through the two cross telescopes; the magnifying eyepieces having been previously drawn out. The clinostat is now at the same angle of inclination at which its contents solidified, and its lower bulb will be found nearly in the axis of the revolving arm, and an inch or more above the centre of a horizontal circular revolving circular mirror, having five or seven parallel lines engraved across its face. Reflected in the mirror will be seen the image of the embedded needle, which, as we know, pointed north before it was fixed by congelation in the bore-hole. If we now revolve the mirror until the 360° or zero of the circle is in line with the *N* or marked end of the needle, and until the engraved lines are exactly parallel with the reflected image of the needle, an index at the side of the graduated mirror frame will give the exact angle between the needle and the vertical plane of revolution of the clinostat, which is in fact the magnetic bearing of the inclined phial and of the bore-hole which it fitted into at the time of the application of the test.

The same operation is repeated with the other five clinostats contained in a rack, which complete the set, and then the results are combined and the means taken in the same manner as if six separate determinations of the same vertical angle and azimuth had been made with a theodolite or an altazimuth instrument. When special accuracy is required, as in very deep bores, it would be advisable not only to examine and specially adjust the plummet, but to obtain and note for constant reference the index error of the magnetic needle in each phial, and apply them as corrections before combining the results of the six readings. These six phials or clinostats, guarded by brass jackets, are encased within and protected by a cylinder or guide-tube. This is a strong brass tube about 6 ft. in length, into which the clinostats, &c., accurately fit, and which is securely closed by air-tight washers against the heaviest water pressure likely to be encountered even in bores of 2000 ft. depth; the glass bulbs of the clinostats being necessarily of too, fragile a construction to bear exposure to such a pressure. The guide-tube is passed down the bore by means of small service piping jointed in measured lengths; the influence of the iron being kept from the magnets by the interposition of a distance-piece of brass, socketed into the other end of the guide-tube or cylinder. When the bore is approximately perpendicular a cord should be attached below the socket and used as a safety line in case of a slip. Where the bore approaches the horizontal, as in testing ground ahead of drives or levels in mines, the socketed application rods are used to force the cylinder to the desired distance; and in any case these must be employed where it is desired to extract a piece of standing core with the test attached. This is an easy and certain way of obtaining not only the true direction of the bore-hole, but also the true dip and strike, underlie and bearings of strata, lodes, reefs, and deposits of all kinds.

A self-registering thermometer, charged with a solidifiant fluid instead of mercury, and immersed in an outer glass tube filled with hot water, and placed with the phials in the guide-tube, will afford, if desired, much information with regard to earth-temperatures at deep levels. Geologists and physicists find interest in the registration of such data at various depths, in diverse strata and above or under water-level; and possibly such facts, intelligently combined, may one day not only advance physical science, but prove of some mining and well-boring value. A thermometer whose contents solidify at the temperature of the precise spot in which it is placed, and which can therefore be easily read after withdrawal, is much more convenient, then, for such a purpose than the ordinary registering thermometers, which have indices easily displaced by shaking, and which, even if underanged, must also, by their very principle, register some intermediate and unintentional maximum or minimum. It is not the highest or lowest temperature encountered in a bore, but the exact temperature of the particular part which we are testing that we desire to know. The new thermometer may range from 40° to 160° if required, and if accidentally heated beyond this the surplus of the fluid used may pass into the safety-return tube:

DEVIATIONS OF DRILL RODS.—It is perfectly natural for those who work Diamond drills and have the charge of them who never see the course of the hole which they bore beyond the first few feet of straight, who look at each length of drill-rod in its 10 or 15 or 20 feet of sturdy stiffness as a thing which cannot bend—it is perfectly natural for such men, intelligent good workmen, proud of their instrument, which has always taken gratuitous credit for boring straight, and so rarely has its winding path opened to the light of day, to disbelieve *in toto* that drills hardly penetrate 20 feet into the strata of the earth before they begin, at first by fractions, then by inches, then by feet, and at last by fathoms, to stray off from the course they should pursue. But if such men, intelligent and observant as they are, once saw 500 ft. of such drill-rods jointed end to end, and lying upon uneven ground—to which this great jointed wire will readily adapt itself, and sag and bend with ease, because of its great length and its poor 1½ in. of thickness—they would no longer accept the doctrine of its infallibility as preached by Diamond drill manufacturers.

And if they were shown a score or more of the finest steel knitting needles jointed end to end, as being an implement of the same proportions as a 500 ft. drill, length for length and diameter for diameter, computed by rule of three, and, therefore, a perfect miniature model of their trusted drill, they would at once see the folly of expecting to bore even approximately straight with such a tool. The wonder would be, not that drills should err, but that they should stray so little as 80 ft. in a course of 500 ft., which they have been proved to do. It is natural, also, that a drill operator should dislike to hear of the peccadilloes and greater errors of his implement, after having for so long believed the simple and easily comprehensible statement that it would bore a straight hole. If it does not bore straight, he will say, what is the use of it? For the main virtue of a drill, which is simply an earth probe, is that the operator should know what ground he is testing. His inability to bore straight for long distances, however, matters little, if he can survey his bore and become thoroughly acquainted with its bore. Boring is, to a certain extent, random and tentative work before it is done, but, when done it is of vital importance that we should know exactly what has been done, or left yet undone, else future work will be wasted.

SCOTCHMAN'S UNITED MINE.—The most obvious waste of work is where the drill has passed through a lode or reef, and where a drive or a shaft, having been carried on for some scores or some hundreds of feet in the supposed direction of the bore-hole, fails to come within sight or sound of it, and where, after passing far beyond where it should be found, and putting forth cross-cuts to intercept it, the prospectors are finally compelled to cut huge chambers in various directions without success. This was done in one instance at Stawell, before the bore-hole was found, as indicated by the test, nearly two score feet away from its proper position, in little more than two-thirds of its full depth. This is a sad waste of time and money; yet similar mishaps have more than once taken place, and will continue to do so until mineowners prefer the certainty of previous survey to the uncertainty of random and costly search. The exact data are given, from which it is seen that 2400*l*. was expended in a year's random exploration *after* the supposed site of the bore-hole at *B* was reached by the main level, 2300*l*. of which would have been saved if the Test had been available before the level was started, and if its direction had been along the line *A E*, thus indicated to *C*, the true site of the bore when found. Thus more than 200*l*. would have been saved by a preliminary survey of the bore and mine, costing but a very small fraction of this sum, say 40*l*. or 50*l*. But the advantages of testing bores which pierce payable lodes or reefs are so obvious that more need scarcely be said. It is when no minerals are touched that, without due consideration, we might say the clinograph is unnecessary. But this is a mistake, and a grave one. Take an example. The bore in *Fig.* 9 is put down to intersect a chance vertical reef (*R*). Not knowing that the hard casing of this reef had deflected the drill to *a*, the bore *B* is put down to *b* without intercepting any reef. Not knowing that this bore is wasted, the bore *C* is pushed down to *c*, being again turned aside by the hard casing of the reef *R R*. A survey of *A a* would have at once suggested the diagonal, and successful, bores *B R* and *D F*. Reckoning the cost of the three bores at 2000*l*., which is a low estimate for reef country, there would be a total loss of that amount if the bores still remain untested; while, if the first bore *A a*, had been tested, and the bores *B R* and *D F* made instead of *B b*, *C c*, there would be two reefs proved, and their exact position ascertained for future workings. Untested and unsurveyed bores are as misleading and disastrous when started upon a nearly horizontal line as when nearly vertical.

CAUSES OF DIVERGENCE.—There are as yet no precise data as to the causes of divergence in any one direction, but it may be safely assumed that the presence of hard lumps or veins, in rocks otherwise homogeneous, will tend to deflect the drill towards softer portions, and that an equal, though contrary, effect will be produced by cavities, crevices, soft veins, and cores. Still more will *recurrent* hard veins (*h h' h''* *Fig.* 10), at angles with the intended line of bore (*c b*), cause the bit to glide sideways toward the softer rock until the vein is penetrated, when the drill will only partially recover its proper direction; and the error will in this case be an increasing one, since each digression brings the drill at a more acute angle to the veins, as at *h' h''*, thus increasing their deflecting power until the bit is at length powerless to penetrate them, and eventually assumes, as at *d*, wholly their direction (*e f*), making finally the bore assume the curve *c d*, instead of the straight line *c b*.

The effect of recurrent soft veins, or fissures, would be the same in a somewhat less degree, since, after passing through a soft vein, or fissure (*c c'*), at angles with its course, the drill would encounter the hard surface of the next stratum at *c*,' upon which it would slide, as already described, before obtaining a hold, and would eventually penetrate at an angle more in accordance with the dip *e f* of the strata, or of the veining, cleavage, lamination, or other recurrent hard and soft planes of stratification. This action frequently repeated will also make the drill pursue a curved course (*c d*), and gradually it will travel only in the crevices in the direction *e f*. If anyone has a doubt as to the effect of alternate hard and soft veins, placed at angles with the line of bore, let him take a very long "bit" and bore with a "brace" into a piece of Oregon timber, at only a slight angle with the grain, and he will be fully satisfied, as the bit will become so curved in the direction of the grain as to become immovable, and at length, if forced, will break. A Diamond drill, being some hundreds of times longer than the longest bit, in proportion to diameter, must be still more subject to this deflection and curvature, and therefore it need be no matter of surprise that these costly instruments, with diamonds set, have occasionally to be abandoned in their bores.

Here, also, there would be a saving from the use of the Test, since there can be little doubt that the difficult and protracted operation

attending many of these bores are due to the inequalities of the strata, which deflect and dangerously curve the drill; and, if in such a case, the Test on being applied proved that the deflection was too great or too sudden for the welfare of so valuable a tool, it would be a prudent course to desist and try another bore, more at right angles with the strata. This could be readily done, since the core-extractor, in conjunction with the Test, would give the lines of stratification with exactness, and indicate the precise angle and bearing upon which the next bore should be put down.

Apart from any such geological cause also, it is to be expected that the slightest deflection or curvature will tend to increase in convexity owing to the onward pressure necessarily used in boring, throwing the rods against the concave side of any curved bore, and pressing also the hinder end of the core-barrel hard against *c* at the same side, while the boring-pit will remain comparatively uninfluenced, except by the inclination of strata, &c., which may tend to increase the evil which, perhaps, this originated. This effect is rudely and—for the sake of clear illustration—of course in an exaggerated way exhibited in the lower part of a sketch. As a proof of the liability of the Diamond drill to deviate, a very crooked piece of core taken at random from a heap at Stawell was produced for inspection. Another potent and general cause of deflection is this; the revolving core-barrel will have a constant tendency to *roll* upon that side of the bore which offers most resistance—whether owing to its superior hardness or to the greater pressure produced by the weight of the drill on the lower side of an inclined or deflected bore—and will worm itself away at right angles to the resistance and in the direction of revolution of the drill.

Alluvial Bores.—These may mislead prospectors, through unknown deviations, as reef-bores will. A diagram was shown to illustrate this. Here the third bore was wasted by the unsurveyed divergence of the second bore, which indicated *fall* instead of *rise*, and induced the third bore to be placed to the right instead of to the left. The manifest loss here is of 400*l*., but if the result is to imagine wrongly that a barren lead has been proved, and No. 3 is not put down on the left, then we must add to this loss that of the value of the wash missed.

Hypothetical cases might be multiplied to illustrate the errors and consequent waste of money and loss of valuable mineral deposits which are continually occurring through the divergence of exploratory bores; and actual examples could with very little trouble be cited from records of such mining properties as the Lord Harry, the Hepburn estate, and others, if the bores should now be tested; but enough has been said to show that, even in alluvial boring, which is said to be less affected by deviations of drills than is reef boring, the risk of lost labour, lost money, lost minerals, and possibly lost drills, is very great unless the bores be tested before the results are taken to account in future operations, and unless also the test be applied promptly in the event of a drill jamming or working badly.

It may be argued by some that it would require a very great divergence in the bore to affect the perpendicular depth materially. It may be interesting, therefore, to state that with the usual form of curvature, and at a depth of 500 ft., a divergence of 40 ft. will make a difference in depth of 3 ft. in a quasi-vertical bore, while 50 ft. will give 5 ft; 60, 7 ft.; 70, 9 ft,; 80 will give 11 ft.; 90, 13 ft.; while 100 ft. —not at all an improbable error at 500 ft. of depth—will cause an error of no less than 15 ft. From this the vertical error rapidly increases until at 150 ft. it amounts to 34 ft. One-half such an error as this is quite sufficient to cause all the difficulties and losses which have been touched upon, and many more; being ample to make level bottom appear either to fall or rise, or to make a real fall appear as a rise and *vice versa*. Even in coal boring, where the strata are proximately horizontal, or only at a slight angle with the horizon, the direction of the dip may be erroneously deduced from untested bores from such errors as these; and unless assisted by accidental outcrops of the carbonaceous strata, may cause needless expenditure in bores or more costly workings.

Direction of Divergence.—It is of some value, as already explained, to know the amount of deviation of a drill from its initial direction, but this information is but partially useful without the knowledge of the bearing of the line of deviation; this knowledge is obtained by means of the self-registering compass, which is combined with the self-registering clinometer in the clinostat.

As to the cost of application, it is so small that the saving of the expense of one bore in every 20, or of 200 ft. of useless exploring shafts or levels in a year, or of one lost set of drill rods within that time, would reimburse the outlay incurred in testing every bore put down by the departmental drills, and would leave the additional certainty and security, the insight and knowledge gained, and—more than all in the prospector's opinion—the additional mineral wealth developed, and the shortening of prospecting operations, as pure gain to the user of the test or clinograph which forms the subject of this paper.

Mode of Application.—In a suitable tin vessel, or in a thin galvanised iron bucket set the bath containing the rack and a set of six or seven clinostats, and pour pure cold water in until the whole is covered. Place this on the fire until the heat reaches about 150° or 160°—say, about simmering only—as steam must not be generated in the clinostats for fear of bursting them, or at least generating mischievous bubbles in the bulbs. Both surveyor and assistant being provided with washleather gloves to protect from scalds, and for the ready handling of the hot receiver or guide-tube and clinostats, take out the brass bath with its contents and keep it near the fire, upon which the bucket should be brought to the boil again.

Unscrew the distance piece, see that the plug (or, core-extractor, if used) is well washered and screwed home, and heat the tube by filling it with the boiling water, closing the open end with one of the spared screwed parts temporarily for convenience, and an equal quantity of water to replenish that used, and replace the bath in the bucket (not replaced on the fire), and convey the whole apparatus to the mouth of the bore-hole, whether on the surface or down in some lower level of a mine, and use the spirit-lamp with two burners (large wicks) to bring the whole up again to 180°, and subsequently the bucket to the boil as before. In the meantime manipulate bubbles out of bulbs through the central hole *h* into the barrel of each clinostat.

Unscrew the top and pour out of the receiver the partly cooled water, refill with boiling water, slant the receiver, passing the phials or clinostats in (first seeing plummets and magnets freely acting) by means of the long brass slide (which fits into the wide slit of each clinostat jacket, and has projections which catch in the jacket-eye), letting the hot water overflow as they enter; screw on the distance-piece with washer, the assistant holding the lower nut with a spanner (or, if the core-extractor, with tongs) while the surveyor gives the final turn to screw home. It should be explained here that the core-extractor is only used when the Test is made at the bottom of a bore, either in progress or completed. At intermediate depths the simple plug is used instead, which is found screwed into the bottom of the guide-tube. Of course, in the above operation the two ends of the guide-tube or cylinder must be firmly secured by accurately-fitting washers against the greatest possible pressure of water to be encountered in the bore. At the same time a *little* air space should be allowed for fear of any pressure upon the bulbs by compressed water.

All this should be done without loss of time (to avoid premature cooling and setting of the fluid), and the apparatus be at once lowered into the bore—if a perpendicular one—by a small wire-rope previously passed through the eye of the distance-piece, or, preferably, and in *all* cases where the bore is inclined or horizontal, there should be previously prepared sufficient lengths of small iron piping to fit into the eye-socket; these lengths, or "application-rods," coupling upon each other down to the required depth. The *effective* length of each of these hollow rods when jointed together should be marked legibly on a brass ferrule fitted upon it, so that the surveyor may readily and with accuracy note the items of the total length put down, both at entrance into and exit from the bore-hole, and sum them up at leisure. It is preferable always to use rods instead of rope in case of obstructions in the bore, and if the core-extractor be used the rods must of necessity be employed to press it down with force over the standing core at the bottom of the bore, so as to snap it off and grasp it firmly for extraction when the clinostats are cooled and "set." A special clinostat is prepared, which must be carefully pressed into the elastic tube upon the inner extremity of the core-extractor before it is screwed in. By the indication of a magnetic plummet in the bulb the whole piece can be replaced by means of a compass and a fine plumb-line at exactly the inclination and azimuth at which it cooled, and thus the core, no matter how much it may have been moved in the interim, can be reset and viewed in its natural position for reference as to the dip and strike of the strata, &c.

Reading the Results.—After from an hour to three hours, according to the temperature of the bore, the apparatus can be removed, avoiding unnecessary violence or shaking, and the distance-piece unscrewed. The cylinder, or guide-tube, should be kept as cool as possible, and approximately at the same inclination as when in the bore. The clinostats—carefully avoiding the bulbs with the warm hand, through this and all subsequent operations, for fear of partial melting and disturbance of indications—must be removed one by one as the slide is drawn out, and either placed in the rack in the bath in cold water, or, preferably, placed at once in the cradle of the clinometer, or recording instrument for measurement.

Of course, the more frequently the test is applied, the more accurately can the curve be followed. Ultimately, there is but little doubt that frequent tests will be made, and test-cores extracted, during the progress of the boring, both for the safety of the drill and for the correct mapping of the strata and mineral deposits pierced, which cannot otherwise be more than guessed at from cores which have been whirled round the compass many times before being viewed. It is well to mention that the bulbs are necessarily very fragile, owing to the thinness essential to the conditions required, and the slightest tap, or sudden heating, or sudden cooling, will break them. In packing for travelling they should be replaced as found in the case, with annular rubber washers over the bulbs. The instrument should be first placed in the box, and then a pad of cork placed on the outstretched foot, slipped upon the levelling screw top; then the arm should be unclamped and allowed to lie at ease upon this pad lest any strain should come upon the tangent-worm. Next pack the clinostas in the bath-rack and spare rack, and place these carefully in their separate divisions of the box. Lastly, spirit lamp, thermometer, reading glass, and level. The last is not required except when examining the various adjustments of the instruments, which can readily be made by any surveyor accustomed to instrumental work, when the mirror must be so levelled by it that it shall revolve without error. Index errors in inclination and azimuth and standard verticals, after the instrument is truly levelled by means of the tripod screws, require attention. The adjustment of the vertical arc in a plane at right angles with the mirror plane; of the axis to be parallel with the mirror plane; and of the parallel motion so that the standard verticals in the object glasses of both telescopes shall remain perpendicular as compared with a delicate plumb line hung at I, at every part of the circuit of the arm—this is work for the instrument maker if the surveyor should find it imperfect.

MINING DISTRICTS OF BEAVER AND GARFIELD COUNTIES, UTAH.

Sir,—Beaver County contains, in addition to the Star and Rocky mining districts, easterly of the same, Bradshaw, Lincoln, Galena, Gordon, Granite, Beaver, Ohio, and Warsaw mining districts. The nearest principal business places to this district are Milford and Beaver City, on and near the line of the Utah Central Railroad. The veins or lodes in these districts are from 2 to 6 ft. wide, carrying from 40 to 54 per cent. lead, and from 20 to 130 ozs. of silver per ton. There are also other lodes which carry from 10 to 27 per cent. copper (mostly as oxides and carbonates and some copper glance) and some gold and silver. Most of these lodes lie at and along the surface for a considerable distance. Near by Beaver Lake district immense deposits of sulphurets and oxides average over 40 per cent. of the pure metal. Copper stain is frequently visible on the hillsides, and there is not the least doubt but every probability that many more valuable lodes and mineral deposits would be discovered, were proper search made, and the numerous indications followed up as they should be. There is not the least doubt but some sections of Beaver County will become very important for copper smelting, and also for the reduction of antimony and bismuth ores. One of the reasons that hitherto little attention has been paid to this important mineral-bearing section of Utah was the former great distance from the railroad, and in some places scarcity of water. Twelve miles west of Beaver City several veins of bismuth ore has been found. These lie near together in a magnesian limestone of silurian age, and vary from 1 to 9 ft. in thickness. The gangue is of a serpentinous character, and carries lime garnets, iron oxides, tremolite, and other minerals. The ore, a sulphide and oxide free from arsenic and antimony, varies from 1 to 6 per cent. of the total vein matter, but it is easily concentrated. In the concentrated product, which gave 30 per cent. of bismuth, molybodnum was found, which, in view of the high price of that metal and its general use, may prove an important discovery. Several shafts sunk upon these properties show strong and well defined veins, and on account of the high price of bismuth, and the rarity of its being found thus free from arsenic and antimony, a fact that has been amply proved, they bid fair to become of very much value. In this same county of Beaver are veins of graphite and deposits of sulphur, which will at no distant day be utilised to their full extent. Indeed few places offer such inducements to capital, or have such good prospects of a golden future as does this Beaver County, or more correctly as the mining districts of Beaver County. About 18 to 20 miles south-east of Warsaw mining district commences Antimony mining district, extending 21 miles east and 20 miles south, and situated in Garfield, formerly Iron County, Utah.

The leading mines are, in Bradshaw mining district, the Cave, Hoodoo, Cypress, Sherman, Triangle, Governor, and Summit Mines. In Lincoln mining district, the Creole, December, Dannerberg, Delaware, Forest Queen, Galena, Quincy, Rollins, Rattler, and Stampede Mines. In Gordon mining district, the Boston Sulphur, Conqueror Sulphur, Excelsior, Mammoth, Mariposa, Prince Albert, Philadelphia Sulphur, Sulphur King, Utah, and New York Sulphur Mines. In Granite mining district, the Bismuth, King Bismuth, Star, and San Francisco Bismuth Mines. In Beaver Lake mining district, the Beaver Lake No. 2, Big Mountain, Belcher, Copper Belt, Filmore, Monarch, and Niagara Mines. In Ohio mining district, the Belcher, Daniel Webster, Great Western, St. Lawrence, Union, and other mines.

The mines of the American Antimony Company consist of 25 claims, covering about 430 acres of antimony mineral-bearing ground, situate in Coyote mining district on a tributary of the east fork of the Sevier river, at the south end of Grass Valley in Garfield (formerly Iron) County, Utah. While there is, in the aggregate, a considerable quantity of oxidised ore present, assaying upwards of 80 per cent. antimony, the great mass of the ore is stibonite, or sulphide of antimony, carrying about 72 per cent. of antimony and 28 per cent. of sulphur. Professor Newberry, of Columbia College, New York, speaking of these mines, says:—The antimony deposits proved to be unique in kind, of great geologic interest, and of much economic importance, and the quality of the ore is equal to any known. The American Antimony Company was organised in 1881 by Anthony Godbe, of Salt Lake City, for the purpose of acquiring and working this very valuable property, since which time the owners have been engaged in making extensive developments and in erecting works for the reduction of the ore into regulus or star metal. These developments have resulted in uncovering and opening large bodies of ore sufficient for a many years' supply for the smelting works, which are at the present time (Dec. 1, 1883) about completed, and ready to start up. The ore lies in almost horizontal beds, and is easily and cheaply mined and extracted. At an experimental trial of the works lately made, several tons of regulus were procured and shipped to New York, and the quality is said to be superior to the best imported metal. This is accounted for by the phenomenal purity of the ore, containing, as it does, not even a trace of these objectionable features so common in all hitherto known antimony ores—as arsenic, copper, lead, &c. Indeed, as will be seen by analyses below, the natural unrefined ores from these Grass Valley Mines are more free from such ingredients, so as arsenic, copper, lead, &c., than the admittedly best imported refined metal (Cockson's). The analyses of the latter was made by Messrs. Booth, Garrett, and Blair, of Philadelphia, and that of the Grass Valley ores, by Professor Lehman, of Baltimore, Maryland. Analyses of Cockson's refined Star metal (regulus):—Arsenic, 1·008; copper, 0·021; lead, 0·410; iron, 0·144; cobalt and nickel, 0·013. Analysis of American Antimony Company's sulphide ore, of Grass Valley:—Metallic antimony, 71·320; sulphur, 28·130; iron, 00·005; arsenic-tin, none; copper-lead, none; quartz, 00·038. The sulphur, being eliminated in the process of smelting, Grass Valley antimony ore is necessarily absolutely pure, and will, it would seem, take the price of the imported article when its merits become known to consumers; and so soon as railroad facilities now in contemplation shall be provided the owners expect to ship the ore in large quantities to the antimony smelters in England. The reduction works, now just about completed, are perfect of their kind, and were erected under the direction of skilled smelters, whose experience was obtained in the business in England and Hungary. The present capacity of these works is about 2 tons of metal per day, but they are so arranged that this amount can be increased to any required capacity. It has been often said by competent authorities that Utah, in great extent and variety of her mineral resources, bids fair to outstrip all her rivals in the Rocky Mountain regions, and I can only verify this in all and every respect, for it is based upon plain facts and realities.

W. Bredemeyer, M.E., U.S. Surveyor.

MINING PROSPECTS IN MEXICO.

Sir,—This country, though about the first discovered on this Continent, has been probably the most neglected in the world, for the unsettled state of the Government, which gave rise to frequent revolutions in the past, tended to deter foreign capitalists from embarking any capital in the rich mining properties with which the country abounds, and so left the development of them to the natives. But it must be borne in mind that Mexicans are a farming people as a rule, and although many vastly rich mines have been discovered, and are being worked at a splendid profit, there remain some very fine mining properties, which may be acquired by a mining company on very easy terms, and would require a mere nominal capital to work.

The introduction of railways and telegraphs all over the country, facilitating intercourse with other countries, has opened the eyes of the Mexican people to the fact that peace is necessary to ensure prosperity, and the Government now rests on a sure foundation, and revolutions and political disturbances are things of the past. What is required in this country is a little foreign capital to develope its vast mineral wealth, and I am convinced from experience that no country offers such splendid inducements to the mining investor as this does. The mineral rights being (primarily) vested in the Government, leases are acquired on very easy terms. Strictly speaking, the Government grant *no leases*, but *give* the ground on payment of a small fee. *No dues are payable until the mine gives dividends*, and then 1-25th *of the profit* is claimed by the State as dues.

This district (Pachuca, in the State of Hidalgo) has long been famous for its rich silver lodes, which were first worked on by the Aztecs, then by the Spaniards, from whom the Mexicans derived the mines at present working. Only two mines in this district owe their existence to modern speculation—Santa Gertrudis and San Cayetano el Bordo. Both were started by English capital, and the former with an outlay of less than $10,000, 2000*l*., has paid in dividends to date over $1,300,000, 240,000*l*., and this in about 6½ years' working, besides well stocking the mine in English machinery of all kinds, and the latter although not being so rich, is giving splendid returns for the invested capital. The other noted mines of this district are the Rosario, Guatamoczin (which alone gave $7,000,000, or 1,400,000*l*. in dividends between 1863 and 1868), San Pedro and Porvenir, were worked under one company, and giving $45,9*l*.. per month dividends, equal to 54 per cent. per annum on the paid-up capital of the mine; San Buena and Maravillas paying dividends at the rate of 30 per cent. per annum, and El Cristo worked by a private company at a splendid profit.

These mines are all situated within a circle of less than three miles, and on the same run of lodes, and in close proximity to them. The writer is aware of setts which may be acquired by a company on very easy terms, and which would require a mere nominal capital to bring into a dividend state, analogy pointing to equally as rich a future for them as for the mines at present working. It should be mentioned that an assay taken recently from one of the properties at surface (back) yielded 24 ozs. of silver to the ton of stuff.

Pachuca, Mexico, Nov. 25. ——— Fred. W. Bawden.

MINING IN SOUTH AUSTRALIA.

Sir,—The *Mining Journal* of Sept. 15 containing my last letter came to hand about a week ago. The tightness of the money market therein alluded to still continues, and the price of copper has not yet improved. It seems strange that with money abundant in London, so that the Bank discount rate is only 2¾ to 3 per cent., the minimum Bank discount rate here should be 8 per cent., and yet our last Government Loan of nearly a million and a half was subscribed for twice over in London, the interest to be paid being only 4 per cent. Some persons say the banks here, of which there are no less than nine, and all doing well, have been "working the oracle" to keep the rates up. However, the proceeds of the loan, the carrying on of public works, and the ingathering of some fifteen millions of bushels of wheat should provide us with a little spare cash for mining. Indeed, some few sanguine spirits, and who that goes in for mining is not sanguine, looking ahead to what may take place a few months hence when money is more plentiful, and when the extended use of the electric light, and of electricity as a motive power shall have produced an increased demand for copper, are engaged in prospecting the country and raising here and there a few sample tons of ore from 20 to 40 per cent. to send down to the Port Smelting Works or to England. There is no doubt that the past year or two has greatly developed our vast mineral resources. The Mount Rose and Blinman Mines especially are being well opened up by the Corporation of South American Copper Mines, and both bid fair to be good, permanent, and payable mines. The Blinman is down to 70 fms., and the workings throughout are in full and satisfactory progress. The produce averages about 23 per cent. and from 1½ to 3 tons of ore per fm. The Victory Mine, between Mount Rose and Beltana, continues to yield good ore, and will by-and-bye be one of the big mines of the North. The Willouran Mine, which was in so good a position 12 months ago, has not yet realised the expectations formed of it; but this is owing in a great measure to the want of sufficient capital to do the amount of deadwork necessary to properly open it up. The mine is really a good one, having a fine show of ore on the surface and going down, from 20 to 50 per cent., and it only requires a fair and judicious expenditure of capital to make it a very productive and payable property. The Northern Railway line is now available for carriage, and runs within eight miles of the mine, so that the ore could be shipped at Port Augusta at a cost for carriage of about 30s. per ton. The original owners of the mine, who retained a large interest in it, have taken a lease of it on tribute for five years.

Other copper discoveries have been made, but at present there is little encouragement to bring them before the public. Argentiferous galena has also been found at no great distance from Farina (200 miles north of Port Augusta) in two or three localities. The richest deposit of this metal hitherto discovered in the Australian colonies appears to be that alluded to in my last letter near the Barrier Ranges, on the border of South Australia and New South Wales. Since then several much richer discoveries have been made, and an assayer said to me, "We must leave off speaking of these silver ores as worth so many ounces to the ton, we must speak of them as we do of copper ores, as so much per cent. of silver." I have myself seen ores which have yielded on assay 10½, 21½, and 44 per cent. of silver. Mr. W. H. J. Slee, Inspector of Mines for the New South Wales Government, has given a report on this district, dated Aug. 10. He says the geological formation consists of felspar, quartzite, porphyry, and micaceous schist, the silver lodes being generally in the last-named formation; but occasionally in the porphyry. Most of them are very flat, only dipping about 1 ft. in 6, and varying in thickness from a mere thread to 2 ft. The strike of the lodes is in all directions of the compass, and the surface in places shows

a perfect network of metallic lodes. The tract of metalliferous country, however, has a north-east strike, and has been traced for several miles into South Australia in a south-westerly direction. Mr. Slee thinks the lodes will not be found to be continuous, but to consist of blocks or shoots of ore pinching out or building and pinching until depth is reached. The deepest shaft at the date of his report was 70 ft. Since then, however, a good deal has been done. Several hundred tons of ore have been sent to England, and sold, I believe, at 16*l.* and over per ton.—*Adelaide, Nov.* 10. J. B. A.

[The report of Mr. W. H. J. Slee, the New South Wales Government Inspector of Mines on the Barrier Silver Mines, was published *in extenso* in the letter of our Sydney Correspondent in the *Mining Journal* of Oct. 13.]

DETACHABLE CHAIN—THE EWART MANUFACTURING COMPANY OF CHICAGO.

SIR,—Kindly insert the following in your next Saturday's *Mining Journal*:—In reference to the remarks in your Journal of Dec. 15 upon my specialities, I beg to inform you that the interest in the detachable drive chain, patenteed by me in October, 1882, has passed for a number of years, by a friendly arrangement, into the hands of the Ewart Manufacturing Company of Chicago, U.S.A., represented in this country by the Ley's Malleable Iron Casting Company of Derby. This company have the sole license for the manufacture of Ewart's and other drive chains, and they allege that my said detachable chain interferes with some of the chains covered by patents, for which they are sole licensees. By inserting the above explanation you will oblige. CHAS. E. HALL.

Meersbrook Bank, Sheffield, Dec. 24.

LONGEVITY OF COAL MINERS.

SIR,—In connection with the agitation lately going on for an advance of wages the dangerous and unhealthy nature of the miners' occupation was frequently alluded to, whilst the public sympathy has been shown on many occasions in the belief that working underground in collieries, irrespective of accidents, tended greatly to shorten the lives of the workmen. But so far as can be ascertained from medical men, and from the statistics on the subject, coal mining is by no means such an unhealthy employment as is generally supposed, nor is the death rate of those engaged in it even so heavy as in many industries carried on at the surface in our manufactories and workshops. In a report of a committee of mining engineers and others presented to Parliament it is stated "that a mine when properly ventilated and drained, and when both the main and side passages are of tolerable height, is not only not unhealthy, but the temperature being moderate and very uniform it is considered as a place of work more salubrious, and even agreeable, than those in which many kinds of labour are carried on above ground." In dry mines there is a good deal of dust always floating about, some of which of course must be inhaled, but in most well-conducted mines the roads are watered, and by this means the dust is kept down. The late eminent engineer, Mr. Mark Fryar, was at considerable trouble in obtaining statistics with respect to the death-rate of miners, and the results he gave in an interesting lecture. He found that the mortality of coal miners was not nearly so great as was that of lead, copper, ironstone, and other miners. Indeed, the mortality amongst coal miners was not higher than it was among other operatives of the same class in the country—in some districts it is not nearly so great as it is among other classes of workmen, taking class for class.

Mr. Embleton, the well-known mining engineer, states that where he lived for 36 years, and where he had ample opportunities for observation, the ages of the colliers far exceeded the ages of the agricultural labourers. "Some of the colliers were able to work until they were 70 and 80 years of age, some of them died about 84, and one or two lived to 90. From the statistics furnished by a medical official connected with a mining district in the North of England, in a population of 6000 persons—only about one-tenth being employed in agricultural pursuits—we find the death-rate of the miners to be below that in other districts where no mining whatever is carried on. Of 101 adults who died out of the population named in two years 26 were between the ages of 20 and 30, 16 were between 30 and 40, 9 between 40 and 50, 26 from 50 to 70, 14 from 70 to 80, 9 from 80 to 90, and 1 upwards of 90. There are here 101 persons above the age of 20 years who died in two years, or under 1 per cent. per annum. These last figures are not exceptional, but may be taken as a fair average of the death-rate in our mining districts. From the figures given, as well as from the facts spoken to by well-known mining engineers, it will be evident that coal mining is not an unhealthy employment, such as it has generally been believed to be, nor is it so very exhausting, seeing that the time a man spends in a mine is only from seven to eight hours a day, and the average number of days worked throughout the year only from four to five.

Barnsley, Dec. 21. J. R.

A DISCURSIVE VIEW IN THE INTEREST OF MINING.

No. IV.

SIR,—In pursuance of the train of thought and line of argument of my last letter. The mania for dividends is impulsive and irrational, by which I mean that the purchase of dividends in many mines developed to that stage is frequently at a rate wholly disproportionate to the accruing interest and the nature of the security involved in the enterprise; the former being very often less than twice the legal rate of interest for the time being, absolutely derivable from enviably secured investments, whilst the security for capital invested in mining properties of the high-strung or wrought-up type is inferior to that, and equally unstable is the accruing interest, deviating almost wholly in one direction only, so that the dividends acquired do not in very many instances compensate for the diminution of capital under such circumstances invested in such enterprises. This view is not in disparagement of dividend-paying mines, and in no sense intended to detract therefrom, but to show that the pioneer practical promoters of such developments and those that purchase the developed prizes are in widely different circumstances as it regards profits or the manner of them. There is an old adage that "gold may be bought too dear," and that is the view I take in respect of mining. If gold may be bought too dear the seller in all probability realises at the expense of the purchaser, who can scarcely hope thereafter to trade profitably on such fictitious value. If the sellers of mines realise more than their true worth those that purchase them do so to positive disadvantage, but whether this be the case or not as it respects either buyer or seller the difference between the cost of developing a good mine and the price of its purchase by other parties when so developed is something enormous. The largest fortunes legitimately made from mining have been made from the mines themselves by those that undertook their development at the primary stages, and not by those who await development before purchasing. An objector would probably interpose the query, but how many blanks are there to one such a prize? a proper answer to which would be by begging the question—how many need there be? A majority of the failures in mining were evident from the beginning. Who amongst practically experienced men that does not know that a large proportion of non-dividend mines—more properly schemes—possess no merit, lacking the elements of success in their every lineament and future, whilst a number of others are retarded in their progress, stagnated, libelled, and scandalised from the lack of means for their proper development, or an improper application of means when amply provided. That there are instances of failures from misgovernment, pure and simple, one need not go 50 miles from this place to obtain the proofs of, where large sums of money have been lavishly expended in extracting superficial deposits, oblivious of transitional change incident to almost all lodes of the true fissure, or permanent class, when passing from the superficial to deeper and more uniformly compact formations of water-laden and water-circulating rocks.

If a mining sett or concession contains the elements indicative of the existence and proximity of metallic minerals a number of contributory features must be present, and definitely recognisable, on the relation and character of which practical judgment are formed from *a priori* reasoning—the causes and conditions exist, and by parity of reason comparatively specific efforts must assuredly follow.

It always has followed, it always will follow in the generality of cases that where kindred conditions prevail kindred effects will be produced. The principal thing to know and understand is how nearly identical one class of phenomena is with another to which it is referred—in form, feature, structure, relative situation individually, and the general composition of the rocks and veins constituting the respective groups. If all the features are favourably determined by analogous facts referred to an admittedly representative standard of undoubted prominence and reliability as the developed exponent of what is and what should be, all the conditions duly observed and respected, the analogy between them becomes the criterion of the prospective estimable value of the one referred, and continues a practice theoritic demonstration pending final conclusions, determinable by resultant efforts at the incipient progressive and advanced stages. Such—as it well known—is as completely possible the most reliable guide to the realisation and determination of values, both prospective and intrinsic, and where such analogies can be traced and found. Similar in outline, symmetrical in form, consonent in constiutional arrangement and mineralogical composition, it passes the bounds of reason not to infer a similarity of results to those inferred from pratically demonstrated kindred realities.

A correspondence of this kind amounts to a moral certainly, an irrefragible probability to which nothing can be excepted but "a bare possibility" that developments may fail to determine a similarity of results as indicated by ocular analogy; and as everything is possible—humanly speaking—that does not imply an absolute contradiction of established facts and terms. Scientific experiment, practical investigation, and human reason can go no further, nor otherwise determine in respect of such phenomena, and it is near enough consonant with the unity of Nature, and the balance of forces physical and intellectual for all practical purposes in the exploration of a department of nature, from which its speculative accompaniment can never be wholly eliminated. But the risk incident to speculative mining may, and should be reduced to a minimum, as it only necessarily attaches to the prospective operations. That certain operations of this kind are necessary in very many—nay, in most—instances for the purpose of disclosing ocularly hidden but circumstantially apprehended features will be readily admitted, but whilst such is the case the outlay involved is comparatively small proportioned to the advantages which currently are, and may be derived from such modes of procedure if property conducted.

Ione, Nye County, Nevada, Dec. 3. ROBERT KNAPP.

CIRCULAR MINING.

SIR,—I am a large shareholder in Wheal Basset Mine, and have lately been pestered with circulars, some for and others against the mine. A particularly curious one from some person who takes care not to sign his name has just reached me. This person tells me that he "willingly expends a few shillings" in trying to frustrate the objects of another "circular" man, and then proceeds to give me some information about the mine—"that it is always going to cut the flat lode, but may never do it." "That it is probable the greater part of a sum of 1583*l.* due in calls at the date of the last meeting will not be recovered, and that this is why the Chairman does not press for payment." "That during the past month the price of tin has fallen, and he understands that less tin has been got," and he ends by advising me not to buy any more shares. Having no means of finding out his name or address, I should wish to tell him through the *Mining Journal* that I am sorry he has given himself so much trouble on my behalf, for though I live abroad and never attend a meeting, I know all about the affairs of the mine from the Chairman, purser, and manager, even to the most minute details I may ask for, that I am perfectly satisfied, and do not want information or advice from outsiders.

The only information I should like to have from him is what he takes care not to give me. I should like to know his name, not because it interests me, but in order to ascertain how many shares he holds in the mine (if he has any, which I rather doubt). I could then be in a better position to judge what his real objects are, for I scarcely imagine he expects us to believe that it is from pure benevolence he expends his time and shillings in our behalf? I wish to add, in conclusion, that for myself I do not wish to receive any more circulars either for or against the mine. They are a great nuisance, whether the senders are those who want to raise the price of shares that they may sell, or to knock them down that they may buy. They must come from one or other of these classes always, but I have generally found that when the shares of a steady, quietly managed, progressive mine begin to be fought over by "circular men" it augurs well for the immediate prospects of the mine, and I shall not be surprised if it should turn out to be so in this case. S. W.

Caen, Dec. 25.

FREE TRADE, AND LOW PRICE OF METALS.

SIR,—I have noticed with great pleasure from the recent correspondence in the *Mining Journal* on this question that at least a few of my countrymen are showing good indications of returning to reason, and I am living in hopes that the time is not far distant when the majority will, and that the outcome will be the drawing up of our commercial treaties on an equitable basis for the mining industry, as hitherto they have not been. I am well aware that it will be a nauseous dose to some parties to return to Protection, after all the gas they have allowed to escape from them and the literature we have been deluged with on the eternal blessings of Free Trade. It is doubtful if some parties, under any circumstances, will ever acknowledge their disbelief in Free Trade, nor is it necessary that they should, so long as the majority does. If Cobden were alive today I do not believe that if he had seen that we were still isolated Free Traders he would have spoken against Protection. It cannot be argued that we have not fairly tried the system; if 40 years have not given us a sufficient knowledge of it, we shall never know it. What did General Grant say respecting it upon his last visit to this country? He said (or words to that effect)—That Free Trade would not suit America, but that it did suit England; meaning, I presume, that if England was fool enough to adopt it, America was not. His speech on the occasion in question was worthy of an astute Yankee, and in this instance they have "licked the Britishers." What too is Bismarck's (one of the greatest living authorities on such matters) opinion? That it will not suit Germany; and I ask, is America or Germany better or worse off because they cling to Protection? Most decidedly the former.

If such a thing as universal Free Trade were possible then I believe there would be unanimity in its belief. But I hold as we have not yet reached the millenium, and it would be presumption on our part to make preparations for it, such a thing as universal Free Trade will never exist, only in the brains of Utopians. Physically, there must certainly be a material difference in our individual make or getting up, especially in the cranium, as it is not a stretch of imagination with me to believe that nothing less than a club will make an impression on some, or our mining industry would not be in the state it is, or so many of our once prosperous trades exiled through the withering curse of one-sided Free Trade. The war whoop of the Free Trader is that the system benefits the multitude, and that if we return to Protection the price of our bread and cheese will be raised. What on earth is the use of cheap bread and cheese, or even tripe, if we have no money to purchase them, through our industries being gradually taken from us by the foreigner, and the languishing state of the remaining through one-sided Free Trade. I could enumerate many industries "gone abroad" through reasons I have given; but only look at that of sugar and lead, the price of the latter, it is encouraging to see, is struggling to rise, and if its struggles prove successful activity in lead mining is sure to follow. But it is too heavily handicapped, and unless your correspondent "Reciprocity's" suggestion is carried out—a protective duty placed on foreign supplies—it will remain so. No wonder English mining capitalists seek fresh fields and pastures new, where their industry is protected, not like in England where the foreigner's interests are predominant, and I fear there is too much "Brummagum ware" in the politicians at present in power to expect anything beneficial from them. A change for the genuine article will be acceptable.

Perranporth, Dec. 26. W. NINESS.

MINING ANOMALIES—MINERS AND MINE LORDS.

The annual meeting of the Mining Institute of Cornwall, held last week, was rendered more than usually interesting by the observations of Mr. C. C. Ross, M.P., on Mining Anomalies. The report of the Council was a very encouraging one; it showed that 14 new members had joined, and eight had been removed from various causes. There were 142 ordinary and two life members. The Exhibition of 1882 and 1883 had been serious drains on their resources, and the trial of the pulverisers had also been expensive, and the Institute was cast in a small adverse balance. They hoped, however, that an appeal would have the result of clearing off the debt. In regard to the pulveriser trial, it was trusted that they had only seen the commencement in this matter. There had been frequent mention at meetings as to the lords' dues, and it was hoped that the discussions would have a beneficial effect. The loss of Dr. Hudson was deplored, and the report spoke highly of the services of the retiring president. The Council recommended the election of Mr. R. J. Frecheville, her Majesty's Government Inspector, as president; Messrs. Henderson and J. L. Bolden as vice-presidents, and Mr. A. Lanyon and Capt. Charles Thomas as members of the Council. The report was adopted. The financial statement showed that there was a debit balance of 22*l.* There was a loss on the Exhibition of 1882 of 30*l.*, of 1883 of 14*l.*, and on the pulverisers of 23*l.*

The Chairman (Mr. J. Henderson, the retiring President), congratulated the members upon the election of Mr. Frecheville as President. He was certain that, as far as he could, as far as his public duties would permit, he would do his duty to the Mining Institute. And if he would devote that attention that his public duties would permit of, they would find that all would go on smoothly and pleasantly.—The President Elect, in returning thanks for his election, said he was deeply sensible of the honour conferred upon him. He confessed that, in the first place, he did not feel disposed to accept of the proffered position. It was for the reason that, during last year, as many of them were doubtless aware, the Mining Record Office had been abolished, and the duties which had been connected with that office had fallen upon the Government Inspectors. His district has been extended, and it now extended from the summit of the Mendips to the Land's End.—Mr. W. Teague, in proposing a vote of thanks to Mr. Henderson, said they could not have selected a better President. Their Chairman had spared no trouble, and he had discharged the duties that had devolved upon him in a very satisfactory manner.

In explaining his object in becoming a member of the institution which had proved so serviceable to the county, Mr. Ross said that it was to learn something, and to ascertain if, as a Member of Parliament, he might be of some assistance to the great cause of mining in Cornwall. In this county there were upwards of 17,000 people employed in mining, exclusive of agents. And if on the ordinary average of between five and six to a family they might calculate upon something like 100,000 persons in this county immediately depending upon mining. But not only so. That was approaching the subject from one point of view. They had also to remember that there was scarcely a trade, scarcely an industry, scarcely a profession that was not more or less directly affected by that which affected the well-being or the contrary of Cornish mining. And, therefore, it was idle, it was superfluous, in such a company as that, to touch more than the very fringe of the subject that bore upon the importance of mining in their midst. He trusted he always endeavoured to take a sanguine view of the situation, however dark might be the outlook. He did not go so far as to say that the knell of Cornish mining was being sounded, but he thought they might go so far as to say, without exaggeration, that the patient was dangerously ill, and that the sexton had had orders to reserve a piece of ground in which to decently inter this venerable institution. But there was always hope while there was life, and Cornish mining had withstood so many vicissitudes in the past that he was hopeful that it would before long improve, and that they might look forward to a bright and handsome future. But there were certainly difficulties which they had to face. There were certain practical difficulties which such an institution as that could deal with—at any rate, it could help to a solution of the difficulties to which he had alluded by bringing them prominently before the public of the county. There was a matter which affected mines in the county which he only became aware of that day. This was the bearing of the Factory Act. He was not a Member of Parliament when this Act was passed. It appeared that there were certain inequalities in that Act which he thought, without any great difficulty, might be redressed. He felt that if proper representations were made by such an influential society to Parliament through the proper channel their county members, they would do all that lay in their power to further their views in that direction. He was interested but to a small extent in mine shares. He spoke on the matter as an outsider, as having derived his information from the daily papers, and he sympathised with the difficulties which beset mining in almost every direction. He would wish to see mining put into a practical shape. He would submit to the society if he could not have their co-operation. He would ask if this society could not effect some practical good by being the medium of conveying the difficulties and grievances of Cornish adventurers and miners to the quarters to which he should presently allude. There were three main difficulties which seemed to beset mining at the present day. There was the great difficulty of foreign competition. There was again the difficulty — the necessary difficulty—with regard to the increase in the rate of wages. There was the third difficulty in reference to the existing tenure under which mines were held from the lords. As to the first two questions, he did not see that that society could do much except continue to be patient and to hope. With regard to the third question, he was hopeful that some practical result might come from a temperate exposition of the difficulties that Cornish mining now suffered from that system—which might in days long ago have been fair, but which at the present time bore with undue severity upon a struggling industry. He was only hoping for a better future. He would speak only of the present relations between the tenant and the landlord. He would speak, too, not as a politician, but as a man of business. There were the question of tenure and the question of dues. As to tenure, he thought they must admit there was a decided anomaly pertaining to it in Cornish mines. In the last session a very important Act was passed—the Agricultural Holdings Bill, and by it the tenant on quitting his farm is compensated for unexhausted improvements. He could not see why the same principle should not apply with equal justice in the case of the Cornish mine adventurers. He was going to put an extreme case, but he had been told it was possible. Was it not possible for a mine or mine adventurers to obtain a lease — he would say for 21 years' duration—and that for the first 20 years' having worked night and day, they should exhaust an endless amount of capital, and develope the resources of the mine, that at the expiration of their lease they might hit a great lode—the El Dorado they had been looking out for—and then, after all this labour, just as they saw the haven of wealth in sight, was it not within the bounds of possibility that the landlord would step in and say that in spite of all they had laid out, in spite of their labour and industry, he would not renew the lease unless they paid him a heavy fine for so doing. He would say that if that was possible—and nobody present would deny its possibility—it was discouraging to the introduction of capital into their mines. For this reason they had the very element that tended to discourage capital being brought amongst them—the element of insecurity. Seeing that the tenant was to receive compensation for unexhausted improvements, he could not perceive how they could avoid the conclusion that, should a landlord seek to raise dues, or inflict a fine, on the termination of a lease, thus obtaining an advantage for himself, he should benefit the tenant for unexhausted improvements. He believed the custom in the other parts of the county was the payment of a minimum rental in the case of mines, and this, it seemed to him, was a very fair way of meeting a very great difficulty. It had always appeared to him that, for a mine to pay dues with one hand and pay calls with the other was an anomaly and as unbusiness like proceeding as he had ever had the pleasure or the misfortune of reading about. They knew that in this county of theirs, their late President told him they had some 150 mines. They found about 40 in the daily papers, and out of these only four paid dividends. A very large number outside were barely paying their

way, and the rest of them were in the happy position of paying calls, and also handing over a large slice to the lords. This was a matter that might be brought very temperately and fairly before the lords. He thought such an institution as that might well do so. That institution, if it existed at all, existed for the benefit of Cornish mining. He did not think they could more properly employ their time than in lending their energies in trying to convince the lords that it was not to the interest of themselves, as well as the adventurers, to meet them half way upon the question. He felt that the mine lords generally were in the position of killing the goose in running after the golden egg. Shou'd Cornish mining ever come to a standstill, who would be the leading sufferers, next to the toiling masses, but the lords themselves? For their own sakes, no less than for the masses of the people, he would venture most earnestly to appeal to them to consider in all its bearings, in all its manifold bearings, that great, most important, and pressing question—the interest of Cornish mines. He had only endeavoured to say a few words as a man of business, and that he thought might assist them. When he thought of the tens of thousands of people whose fortunes were bound up with Cornish mining his heart went out to them, as their interests were fraught with the greatest danger. Whether as a humble citizen or as a Member of Parliament, he should ever be ready to help Cornish mining or that institution.

INFLUENCES OF JUNCTIONS AND INTERSECTIONS UPON METALLIFEROUS VEINS.

In an interesting and exhaustive paper upon this subject, recently read before the Mining Institute of Cornwall, Captain Charles Thomas observed that it had been frequently noted that if Carn Brea monument be taken as a centre, and with a radius of a mile and a-half, a circle be described from that centre, this limited circle would enclose mines yielding about two-thirds of the total tin supply of Cornwall. Another interesting fact in connection with the subject of distribution of minerals throughout Cornwall was that the commercially profitable metal-yielding ground of the county, although it extended longitudinally almost from the Land's End to the Tamar, was only four or five miles in width, and was an immediate connection with the junction of killas and granite. To this general rule there were a few isolated exceptions. Bordering on the north side of this productive channel of ground, there was a general alteration in the appearance of the killas, which in many places between St. Ives and Padstow changed to a darker colour, became more compact, and occasionally contained extensive deposits of lead. The foregoing notes were simply general; his paper was intended to treat of particular details of various conditions and features observable in the districts defined. Cross-courses, to which he would first refer, as a rule ran about north and south, and not only materially decreased in size, but also lost their power to influence the productiveness of lodes as depth increased. Mias's cross-course, which existed at and above the 200 fathom level in Cook's Kitchen Mine, and in immediate connection with which very rich deposits, especially of copper, were made at and above that level, could not even be discovered in the deeper levels, and was practically lost. The great cross-course of the district had been traced for miles from Wheal Grenville, through Dolcoath, Wheal Seton, and Wheal Crofty, almost to the north cliffs. Many of the great copper deposits of Dolcoath, Cook's Kitchen, North Roskear, and Wheal Seton were within 50 fms. of this cross-course. But notwithstanding that several lodes had produced large quantities of rich copper against the cross-course at shallow depths, the same lodes failed to produce mineral in payable quantities near the cross-course at a depth of (say) 200 or 300 fms. It was well known that elvans generally ran about east and west, and had an underlay of from 6 to 12 ft. in one perpendicular fathom.

Nearly all elvan courses, he continued, carried more or less water, but a few exceptional elvans were perfectly dry. These dry elvans always impoverished and never enriched a lode; as an instance, he might refer to the elvan in the north part of Dolcoath. Wet or water bearing elvans, on the contrary, especially in the killas, and occasionally in the granite, exerted a very powerful influence—an influence that was sometimes shown not only in great length on one lode but on several lodes. The most noteworthy cases he knew of were the North and South Roskear and Seton elvans. In fact, so far as Cornish mines in the killas were concerned, very little mineral of value had been discovered apart from either elvans or deposits of greenstone. Along the line of the junction of killas and granite everywhere, it had long been the custom to look out for improvements, and the importance of pushing on to reach this junction was universally recognised. They were now compelled to work their mines to a great depth. Cross-courses died out and lost their power as depth increased, so that they could not reasonably look to them for hopes of improvement. It was almost as certain that elvan courses, if not destroyed, were very seriously disordered in deep granite (not in killas), for elvan, if met with in deep granite, was no longer a defined vein, but occurred, as a rule, in patches. Persons interested in mining had more especially to look after the junction or intersection of one lode with or by another. His observation of such junctions and intersections showed him that the best results were produced—1st, in cases where one lode formed a small angle with the other; 2nd, in cases where at least one lode was previously well defined and productive. In either case the results were best when there was not merely an intersection, but a junction, both lodes continuing together from the point of contact. Capt. Thomas gave some illustrations in Cornish and foreign mines of this fact of metal being found at or near the junction of two or more lodes, including Devon Great Consols, the riches of which were found principally in connection with a junction of two or more lodes which converged and met at a point in the sett; and South Roskear, where the caunter, Roberts's, and the main lodes met and continued as one lode for over 300 fms. in length, when the caunter lode again resumed its old bearing and character, leaving the other two lodes permanently together. Within the 300 fms. nearly the whole of old South Roskear riches were found. The most remarkable instance in this neighbourhood was Dolcoath, where the main lode had been fed continually by droppers from the south on the hanging-wall, the latest being the new south lode. At the junction of the main and new south lodes in Dolcoath, there was an enormously rich deposit of tin for some 150 fms. in length. This same junction of the same lodes extended eastward at a somewhat increased depth, and this feature, therefore, was important not only to Dolcoath adventurers, but because of the promises held out to Cook's Kitchen, Tincroft, and Carn Brea Mines n the future.

Summarising the conclusions he had arrived at concerning the influence of junctions and intersections upon metalliferous veins, Capt. Thomas maintained—1. That as cross-courses did not maintain their size and strength in depth, some of them actually disappearing altogether, they had not the same influence upon lodes in depth as they had nearer the surface. 2. That, at least in the granite, elvans possessed a similar characteristic, becoming in depth greatly disordered if not entirely destroyed. Hence it followed that the chances of finding mineral in association with cross-courses and elvans shallow were to a great extent lost in depth. 3. That the junction of killas and granite universally exerted a powerful influence for good upon all metalliferous lodes. 4. That as miners in a deep granite district, they had the great and important feature of the junction or intersection of lodes with or by each other. With existing circumstances before him, he could only believe that deep mining in Cornwall had a long and successful future before it. Agents were necessarily bound to closely watch the character and changes of each individual lode. No matter how large or productive any lode might be at any given point, it would eventually fail altogether, unless it received support from some other lode or branch.

The discussion which followed the reading of the paper brought forward many important facts which had been ascertained by the several speakers in the course of their practical experience. Capt. William Teague alluded to the fact that in two copper mines in one parish, in the one—Tresavean—the killas was worthless, but the moment the lode became settled in the granite some of the richest and finest bunches of copper ore had been found, and enormous profits obtained from them; while the other mine—Wheal Unity—one of the richest mines in its day, produced enormous riches in the killas, and next to nothing was found in the granite. These striking differences had never been explained to his satisfaction. In another mine, Capt. Teague had seen a wet elvan which came in contact with the killas, and within 10 fathoms of the point of contact it appeared to have driven everything out of the lode, and it was impossible to fix upon where to drive further. The dry elvan, he was sorry to say, had played havoc in another parish with several mines, though how that was accounted for he was unable to say. It was very true that the cross-courses were not found to make directly over each other; the shoots of ore were generally found to go east or west. Mr. Teague was inclined to think that this lay of the cross-courses was owing to the dip of the mineral bearing ground, and not to the cross-courses themselves. Referring to East Pool, of which he is manager, Capt. Bishop said that the junction of killas and granite had changed the lode from copper to tin in about 5 fathoms. A copper lode in the 150 fathom level changed into a very good tin lode, there being almost an entire absence of copper until the next level was reached. Their own experience at East Pool was that the cross-course did not diminish in depth as far as they had gone, but rather maintained its size fully, and was, perhaps, a little larger. Capt. Bishop had also found that wherever any two lodes formed a junction near a cross-course there was a good deposit of mineral, but where the junction was formed not near a cross-course, the lode had not been so productive. Therefore, judging from that fact, the cross-course must have a very great influence on the junction. Capt. Craze said it was the junction of West Basset flat lode and the old engine-lode of West Frances which made a very rich ore deposit of tin at West Basset.

The effect of cross-courses was rather doubted by Capt. W. T. White, who said that at Wheal Peevor they had a cross-course which ran north and south, and had not the slightest effect in heaving the lode, which was more productive east and west of the cross-course on alternate levels. Capt. White believed that the chief portion of, if not all, the mineral that was being raised in Levant was being raised in killas ground; but the President (Mr. J. Henderson, C.E.) remarked that although this was so it was not very far from granite. The throwing of the lode by the influence of the cross-course in West Poldice was referred to by Capt. W. Teague, jun., who also mentioned that in Carn Brea there was a right and left hand heave on the same cross-course. Capt. John Hosking believed that in most Cornish mines that had been productive junctions had been favourable as a rule. What held good in one district in reference to the matters to which Capt. Charles Thomas had alluded in his paper did not hold good in another. Mr. R. S. Teague questioned whether large county cross-courses had been known in depth to diminish or die away, and suggested that the cross-courses which had so diminished or disappeared were only little limbs from a main cross-course.—Capt. C. Thomas said that the cross-course which he had spoken of as disappearing was a separate cross-course.—Capt. Craze gave instances of cross-courses which had not only not become smaller or disappeared, but had increased in size in deeper levels.—The President said that he had had great experience in visiting almost every mine in the county. In his experience the junction of two or more lodes, when the converging lodes were underlying in the same direction, formed usually a deposit of tin or ore, as the case might be; but if the lodes converging underlied in an opposite direction, very likely nothing worth searching for would be found. That fact was impressed on him when he went underground many years ago, and he thought what he had stated on the point was almost a golden rule.

THE MARSAUT SAFETY-LAMP.

IMPROVEMENTS BY MR. J. DICKINSON, CHIEF INSPECTOR OF MINES.

Recently a paper "On the New Marsaut Safety-lamp for Mines," was read before the members of the Manchester Geological Society by Mr. Joseph Dickinson, Her Majesty's Chief Inspector of Mines, and a summary of this paper was at the time given in these columns. Since then a number of experimental tests with the lamp have been carried out by Mr. Dickinson, with the result that certain modifications have been introduced, and an improved "Marsaut" made in accordance with these tests was on Friday last introduced into the Altham Colliery, the scene of the recent disastrous explosion. We have been furnished by Mr. Dickinson with a record of the details of these experiments, and it will interest our mining readers to know the results of these trials, and the course adopted in testing the lamp. The tests were carried out at the Celynen Colliery, Monmouthshire, and by the kindness of Mr. J. T. Green, the manager, the special apparatus at the above collieries was made available for the purpose. The lamp was tested by being put into a tube or pipe, and exposing it to quick and varying currents of an explosive mixture of lighting gas, nearly all the series of tests being made three times, with the following results:—1st Tests.—The Marsaut lamp, as sent by M. Marsaut, and as described in the paper read by Mr. Dickinson, went out, but gas continued burning under the gauze. The Celynen-Mueseler lamp, tested at the same time, went out entirely. The Celynen has a shield about 2 in. in depth around the bottom of the gauze cylinder, resting on the top ring over the glass, and has also a strip of tinned iron, about ½ in. broad, strapped round the part of the chimney close to the underside of the gauze disc or diaphragm, which projects 3-16ths in. at one side, to prevent gas burning underneath the disc in explosive currents.

2nd Tests.—The Marsaut, with the addition of a strip of tin-plate, about ½ in. in width, placed from the top to the bottom against the inner side of the inner gauze cylinder; the lamp went out as before, but gas continued burning under the gauze, as before. The Celynen Mueseler went out entirely. 3rd Tests.—The Marsaut, with the addition of a strip of safety-lamp gauze dividing entirely the inner gauze cylinder from top to bottom; the lamp went out, but gas continued burning under the gauze as before. The Celynen-Mueseler went out entirely. 4th Tests.—The Marsaut, with the addition of a third gauze cylinder placed outside the two other gauzes, the lamp went out, but gas continued burning under the gauze as before. The Celynen-Mueseler divested of its gauze cylinder, but in other respects as before went out entirely. 5th Tests.—The Marsaut, with the outlet apertures at the top of the outer casing so covered as only to admit of the lamp burning freely, went out, but gas continued burning under the gauze as before. The Celynen-Muesecler and an Evan Thomas lamp went out entirely. 6th Tests.—The Marsaut, with the outlet apertures covered as in No. 5 tests, and with all the side inlet holes covered, and also with about one-half of the inlet space at the top of the crown or inner rim covered, all the air having to come up the vertical holes, and just enough air allowed for the lamp to burn brightly; the lamp went out, and then, with one flash of gas under the gauze, it went out entirely. The Celynen and the Evan Thomas also went out entirely. This was repeated three times with the same results. About 20 tests were made. In none of them did gas fire outside the Marsaut; but in those tests where gas continued burning underneath the gauze, and where it so burned for about half a minute without going out, Mr. Dickinson observes that it seems probable that it would have fired through if the test had been continued long enough. These tests, Mr. Dickinson adds, show indisputably that if the Marsaut lamp is to be used where it may be exposed to a current of explosive gas, a change in the construction will be required. Mr. Marsaut has tried a moveable ring for closing the air apertures so as to extinguish the lamp. A ring for this purpose would enable a person in an emergency to extinguish entirely the lamps as at present constructed; but unless he closed the apertures gas would still continue burning underneath the gauze, and might fire through eventually in an explosive current.

To be safe, therefore, and independent of any such closing having to be done in an emergency the lamp should be self-extinguishing. To secure this Mr. Dickinson urges that the inlet and outlet apertures should be only so large as to admit of the lamp burning freely, and that apparently the whole of the inlet should be up the vertical holes without any through the side inlets, and that the outer casing should not be removable, as it is now, but should be fixed either to the cage or be locked. The lamp, with the size of the inlet and outlet appertures thus limited, loses some of its advantages. It at first burns dimly if the casing is put on cold, but that is overcome in a few moments as the casing becomes warmed. The light then given is good, but not quite equal to that with the large apestures, and it goes out more readily when tilted. Apparently, however, some drawback of this kind is inseparable from a good and safe lamp. Based upon these trials, a lamp on the Marsaut principle, but with smaller inlet and outlet aperatures has been made by Mr. Teale, and as already stated, has been introduced into the Altham Colliery. This improved lamp was tested at the Celynen Colliery on the 12th inst., and Mr. Green, the manager, reports as follows:—"I have severely tested the lamp and find that while there is sufficient ventilation it goes out quickly in sharp currents of gas and air, and, in fact, acts in a satisfactory manner. I see one objection to the casing being fixed to the lamps, and it is this. Occasionally we find that in pushing the gauze up home the bottom flange of the same becomes a little displaced. In the present modified form this could not be observed, and I think a valuable addition would be made to the lamps by fixing a male and female screw on the ring and the bottom of the case respectively, so that an inspection of the gauze might be obtained after they were up in their places by simply unscrewing the case and pushing it upwards."

SCOTCH PIG-IRON WARRANT MARKET.

Mr. W. Wilson (Glasgow, Dec. 26) writes:—The warrant market continues quiet, and will not be improved by the returns of stock, &c., just issued. The stock which was reduced by 104,000 tons in 1882 remains this year practically the same, whereas a further reduction of 30,000 to 50,000 tons was looked for. Scotch ironmasters have had to compete this year with a keener competition from both Cumberland and Cleveland. The consumption of Scotch iron has been displaced by the irons of these districts to the extent of 100,000 tons. This has necessitated reduced production here. We start the year with nine fewer furnaces blowing, and probably still more must go out. Shipments are small for the week, and do not compare favourably. A furnace has been lighted at Gartsherrie, making the number blowing 103. 694 tons were put into store here last week, while 56 tons were taken out at Middlesborough. The market opened flat to-day with business at 43s. 3d. to 43s. 0½d. cash, also at 43s. 4d. to 43s. 2d. one month. It closed sellers 43s. 0½d. cash, and 43s. 2½d. one month, with buyers near. Business was done during the past week at the following prompt cash prices:—

Thursday, Dec. 20.	Friday, Dec. 21.		Monday, Dec. 24.	
43/6, 43/7 ...	43/7, 43/9, 43/8	...	—	
Tuesday, Dec. 25.	Wednesday, Dec. 26.		Thursday, Dec. 27.	
— ...	43/1½, 43/3, 43/0½	...	43/, 42/10, 43/0½	
	1883.	1882.	1881.	1880.
Price of Scotch Warrants, Dec. 26...	43/1½ ...	49/1 ...	51/1½ ...	52/
Furnaces in blast in Scotland do. ...	103 ...	112 ...	105 ...	123
Iron in store at this date	534,133 ...	608,629 ...	627,138 ...	495,650
Shipments of Scotch pig-iron for week ending Dec. 22.....	7,607 ...	11,412 ...	9,322 ...	8,783
Do. since beginning of year	623,657 ...	620,196 ...	562,529 ...	651,223
Price of Middlesbro', No. 3, Dec. 26	36/3 ...	43/3 ...	42/9 ...	39/3
Furnaces in blast Middlesbro' dist.	116 ...	121 ...	116 ...	118
Middlesbro' Iron Imported at Grangemouth, week ending Dec. 22	3,685 ...	6,460 ...	6,176 ...	6,175
Do. do. since beginning of year ...	273,198 ...	238,036 ...	312,601 ...	283,267

FOREIGN MINING AND METALLURGY.

The condition of the Iron Trade appears to be growing still worse at Paris. Some of the forges have been selling iron, delivered free in the French capital, at 6*l.* 4s. per ton—a price equivalent to 5*l.* 16s. per ton at the forges. This is a further fall, and one which must be regarded as a rather serious and sensible one. There appears little doubt that orders are falling off, hence the depression in prices. The state of affairs appears rather better in the provinces than at Paris, and in the Nord forgemasters have shown a disposition to abandon the market of the capital, as regards certain products, rather than submit to continued reductions destroying all hope of profit. The orders given out by great companies are of less importance than had been hoped for, and it appears unlikely that any serious improvement will take place under this head until the autumn of 1884. The Western of France Railway Company has, however, ordered 20 locomotives from the Coil Works, and 20 others from the Alsatian Company. The St. Nazaire Works have also obtained an order for plates for two large transatlantic steamers; these plates are to be delivered at 9*l.* per ton. The Firminy Steelworks have obtained an order for the axles and tyres required for locomotives to be constructed at the Fives-Lille Works; the Denain Works have secured the order for the plates required. We learn from Bilbao that current transactions have taken place in Campónil iron ore at 7s. per ton, and in Ruhio at 6s. 4d. per ton. Transactions have been moving on rather sluggishly in the German iron trade, the demand being much reduced.

The Belgian Coal Trade has not shown any material change: Some coalowners appear to be rather dissatisfied, however, with the short duration of the cold weather, since it is unusual for the winter to be really rigorous after Jan. 1. As matters now stand, spring is approaching, considerable supplies of household coal have been laid in, and it is thought that it will be a matter of some difficulty to maintain prices. However, quotations have been supported for the present, although coal for metallurgical purposes has shown some little weakness, not making more than 7s. 6d. per ton in the Charleroi district, 8s. per ton being the current rate at Liége. A quotation of 12s. per ton has been maintained for coke, but few transactions have taken place; and although production has been reduced, stocks appear to be increasing to rather a sensible extent. Coal is still selling freely in Germany; all the collieries are well provided with orders, and at present there are no complaints as to the course taken by deliveries. The fiscal collieries of the Sarre appear to be doing well; their extraction in November amounted to 521,030 tons, while the deliveries made in the same period attained an aggregate of 529,083 tons. In November, 1882, the extraction was 465,762 tons, while the deliveries were 462,201 tons. Coke has been rather neglected upon the German markets, but other descriptions of combustibles have maintained their rates well. The dulness of coke is attributable to the magnitude of the production and the reduced consumption of the blast-furnaces.

Contracts which have just been let for rolling-stock for the Belgian State Railways reflect the weakness in Belgian industrial circles. Thus trucks were contracted for at 82*l.* per truck, while 18 months since similar trucks were let at 108*l.* each, showing a fall of nearly 25 per cent. in the course of a year and a-half. Belgian mechanical industry is in fact in a condition which can but be regarded as very grave if it should last long; the works have certainly orders on hand, and they could probably procure more without much difficulty, but only at prices which leave scarcely any profit. November was not a bad month for the rolling-mills, but within the last three weeks orders have almost ceased. We have just indicated the difficulties of the mechanical construction works. English casting pig has fallen to 2*l.* 3s. to 2*l.* 3s. 10d. per ton in Belgium. Refining pig has been in little demand; stocks are accumulating, and there is a talk about blowing out three furnaces in the Charleroi district. Hard pig has continued to be quoted nominally at 2*l.* 4s. per ton, but any important transaction could be carried through at 2*l.* 2s. per ton. Ordinary pig has been weak at 2*l.* per ton, and mixed pig at 1*l.* 16s. per ton. Iron is still quoted nominally at 5*l.* per ton, but small concessions have been made here and there, and the difference per ton per number has been reduced to 6s. per ton, so that No. 2 stands at 5*l.* 6s. per ton, and No. 3 at 5*l.* 12s. per ton. Ordinary girders have been selling at 5*l.* 2s. per ton, and in some cases 5*l.* 4s. and even 5*l.* 6s. per ton has been made.

BRATSBERG COPPER MINES, NORWAY.—No. II.

The importance of continuing this main cross-cut adit can scarcely be overrated, inasmuch as it will thoroughly prove the whole of the Aamdal lodes, and will undoubtedly lead to fresh discoveries besides affording great facilities for the future development of the property.

NÆSMARK LODE.

This lode has a main bearing of nearly due north and south, and underlies about 2 ft. per fathom. An adit level has been driven on its course north at about a depth of 27 fms. from the top of the mountain.

This lode presents some rather extraordinary features being composed of a quantity of rock crystal, quartz, felspar, mica, chlorite, and very pure rich argentiferous grey copper ore running in branches, and also more or less disseminated throughout its whole width, 12 to 14 ft. yielding 5 cwt. of this ore per fathom. This level has been extended north altogether 100 fms., and has proved to be worth for that length 5 cwt. of rich ore per fathom. The backs have been stoped in the usual way for about 5 fms. in height and 30 fms. in length, leaving a great extent of available ore ground still standing.

This lode it will be very desirable to sink upon by a shaft to be continued down directly underneath the air-shaft which now communicates with the surface, as there is every reason to suppose that the lode will become more productive of copper in depth, and judging from the mass of chlorite, mica, and carbonate of iron which it contains there is a great probability of its becoming also richer in silver, which may probably become separated from the copper in another portion of the vein.

MOSNAP MINE—MOSNAP LODE.

This extraordinary lode, so far as can be seen at present, seems to be a caunter or quarter-point lode. At the top of the mountain there are old workings by former companies, and the parts of the lode left standing in the backs are very valuable. There is a main shaft sunk on the course of the lode to a depth of 15 fms. in a magnificent course of ore, and in the present bottom the lode is 20 ft. wide, composed of fine quartz, capel, felspar, mica, and rich yellow copper pyrites, and bornite copper ore, worth 300*l.* per fathom. There is valuable ore ground to the extent of 30 fms. in length and 10 fms. high now available for stoping in the back, worth on an average 30*l.* per fathom.

It is of the utmost importance that the prosecution of this mine be continued with all speed, both in sinking and driving, as these explorations, there can be no doubt, would lead to further extraordinary discoveries.

In order to prepare the ore from this lode with greater facility for the market, instead of its being taken as is now done into Aamdal, a road should be made at the foot of the lake to a proposed dressing-floor where there is ample water-power, and a water-wheel is erected, and where much work is already done towards laying out a good dressing-floor.

There is a cross-cut driven into the mountain at about a depth of 13 fms. for the intersection of this great and productive lode. It is already driven towards the lode 40 fms., and must now be within a few fathoms of intersecting it. This cross-cut should be resumed without the least delay.

GULDNÆS MINE—GULDNÆS LODE.

Having alluded to the composition and character of this extraordinary lode I will now endeavour to describe the manner in which it has so far been prosecuted.

The principal workings are on the surface by two large quarries. The first, which is directly in the valley of Sundsbarm, takes the whole breadth of the lode, 100 ft., and the lode is broken down in mass for its whole width.

The other is to the east of the valley, and strictly speaking in the hill which rises just above, and in this working the lode is somewhat increased in size and altered in composition and character, carrying a flookan course and more felspar, barytes, iron pyrites, and copper pyrites.

As before observed the chief components of the lode are fine light capel, fine quartz, felspar, barytes, prian, magnetic iron, sulphur mundic, with rich sulphides of copper ore.

In the first quarry a cross-cut has been put through the lode into the mountain proving its extent in width, and where it is of the same general character as above described.

In No. 2 quarry, the bottom of which could not be examined in consequence of a deep accumulation of snow therein, the lode is opened upon for 100 ft. in width, 70 ft. in length, and 90 ft. deep on an average, and towards the south-eastern portion there is a rich flookan course some 3 or 4 ft. wide, bordering close upon which there is a rich vein of yellow copper ore 3 ft. wide, running down by the side to the very bottom of the working.

This vein of ore runs across the whole breadth of the quarry, and Capt. Daw informs me it will yield fully 1½ ton of rich (20 per cent.) ore per fathom. In confirmation of this valuation of the produce of the vein, I quote the following memorandum from Mr. Carrington, jun., F.G.S., which was made upon his inspection of the lode at this point in April, 1869:—"No. 2 looks well; for a distance of 15 yards a course of lode has been opened, yielding 1½ ton per fathom, and looks well for an improvement." I may also state that the ore in this No. 2 quarry is more concentrated than in No. 1, especially to the south-west and north of the flookan. From the western side of the above vein of copper ore for a width of 2 fms. the lode is composed of strong capel, felspar, quartz, a little flookan, and a quantity of sulphur mundic scattered throughout with rich yellow copper ore worth about 1 ton per fathom.

In two other pits (much less in size) put down on the back of the lode further to the east, called Nos. 3 and 6, the lode is just of the same nature, and in one portion, the bottom of No. 6, it will produce 1½ ton of very rich sulphide of copper per fathom with ore disseminated throughout the other parts.

In addition to the above there is further to the east, just at the base of the mountain, a cross-cut driven in a direction east of south about 60 fms., where it intersected the lode which proved of the same fine composition and value as given above, and to the west of No. 2 quarry a level is being driven east into the lode which will come in underneath the run of ore by the side of the flookan referred to above, and which is also gone down in the bottom of No. 2 quarry.

Seeing that the most productive and concentrated deposits of ore in this immense lode lie alongside the flookan, I would advise that a good shaft be sunk thereon, and in deepening this portion may reasonably be expected to become still more productive. Cross-cuts for proof of the other parts of the lode can easily be put out at different points considered most desirable as the workings progress.

By this mode of operation the lode will be proved in every direction, and as good results may reasonably be expected in depth, it would in the main, in all probability, prove more profitable than by continuing the quarrying on the surface of the lode where the ore is so much scattered. I am, however, persuaded that even by quarrying certain profits can be realised at an average price of copper.

At this mine there is a 24 in. horizontal steam-engine in good condition which works a crusher with rolls (22 in. by 14 in.), two Borlase's buddles, one good plunger ore separator, and two jigging machines for dressing. This engine could also be used for the sinking in No. 2 quarry.

In reviewing the whole of the lodes (varying in size from 10 to 100 ft. wide) at Aamdal, Mosnap, and Guldnæs it will, I think, appear evident that they bear generally the most favourable mineralogical features, the nature of the rocks in which they are embedded is also most congenial for the production of mineral, and the walls of the lodes throughout are regular and well defined, and in the future development of the properties I beg to submit the following mode of operation in addition to the recommendation given above with regard to Guldnæs, which I consider should be worked as a separate department:—

First of all it will be desirable to resume the driving of the main cross-cut for the intersection of all the other lodes at Aamdal. Also to sink and drive on the Johannes lode, which I think may be considered the most promising and masterly so far as can be seen of the Aamdal east and west lodes. To resume No. 3 adit level on the Hoffnung lode, to sink with more vigour on the lode at Mosnap, to drive east and west on its course, and resume the cross-cut adit for the intersection of the lode at a deeper point in the hill. All the present points of operation to be continued, if possible, with mo strength.

It is satisfactory to observe that since the mines have been under the management of Capt. Daw he has conducted them in a very systematic and minerlike manner, and but for the curtailment of the operations he had in view some two years since, I am fully persuaded that by this time the mines would have been placed into a good dividend paying position.

Within the past 12 months, with only 15 hands employed underground, a profit of something like 2000*l.* will be realised.

The carriage of the ores from the works to England forms at present a costly item, varying from 50s. to 55s. per ton, but when it is taken into consideration that there are no liabilities as regards royalty (dues) or land damage of any kind, the saving of the latter nearly counterbalances the expenditure of the former.

There are certain disadvantages resulting from the long winters of seven months, principally from the discontinuance of dressing operations, which I proposed should be remedied by enclosing all the dressing departments in strong wooden houses heated by fires, there being a plentiful supply of fuel obtainable at all seasons from the forests, and more can and should at once be purchased.

Labour is also plentiful, and wages reasonable. The most industrious labourers are the Swedes, and Capt. Daw is careful to secure their services whenever an opportunity occurs.

I estimate the present total value of available ore ground at about 30,000*l.* This, to speak more particularly, is actual workable ground, calculated only for 5 fms. in height and for the length of the levels as given above, and, I should observe, that the yield of ore on the Hoffnung, Næsmark, and Mosnap lodes having proved generally of great regularity, and in what may be considered remuneratively productive quantities for an extent on the whole of nearly 2 miles in length, and as there are great heights and depths of unexplored ground still standing on those lodes it is more than probable that the produce will prove to be considerably more than the sum stated above in the course of the next two or three years. Additional returns may also reasonably be expected from the prosecution and development of other lodes throughout the properties.

From 80 to 100 men (extra) could at once be advantageously employed in the mines, which number might be increased to 500 as the work progresses during the next two or three years, by which time the mines in all probability (provided they are fairly and economically developed) will give a very handsome profit.

In conclusion, I would observe that all the ores throughout the mines are exceedingly rich in silver, varying from 12 to 80 ozs. per ton, and I congratulate you on the possession of properties, which, if effectually developed, cannot fail to become great and profitable mines through a long series of years. GEORGE F. RICHARDS.

THE AMERICAN TIN TRADE—STATISTICS OF TIN.

Nov. 1, 1883.—Stock in all hands, New York, Boston, and Philadelphia ..... Tons				1,282
Imported during Sep. Straits and Malacca, into Boston			—	
" " " into New York			1085	
" " Australian,	"	"	200	
" " L. & F., and refined	"		50	
" " Banca and Billiton	"		30=	1,367
Total				2,647
Consumption—During November ..... Tons				1,100
Total spot Stock				1,547
Afloat to date, Straits and Malacca, Sept., Oct., and Nov., shipments, per steamers ..... Tons			673	
ditto ditto from London stocks (estimated)			100	
ditto Australian (estimated)			50	
ditto Billiton and Banca estimated			20=	843
Total in all hands, spot and afloat ..... Tons				2,390

The Metal Market during November has shown no special activity, but consumption has been well maintained. In pig-tin prices show a considerable decline, the London market leading in the downward course owing to heavy supplies received there, while American operators (although their own stocks to arrive were being materially reduced) showed no disposition to support London in any way by taking part of the tin destined for that market, and simply allowed matters to take their own course, The market opened at 20⅜c. cash, and 20⅝c. 30 days for spot, and 20⅜ to ½ futures, and steadily declined, with no reactions of any consequence until 19⅛c. cash and 19¼c. 30 days on spot, and 19⅛c. to ¼ cash for futures were reached. At this point a sudden reaction in London, in which this market sympathised, carried the price ½ to ⅝ per lb. higher; but the advance was lost within a few days, and the market closed at 19c. cash and 19⅛c. 30 days on spot, and 19c. to 18⅞c. cash for futures. The London market opened at 93*l.*, and declined to 85*l.* 10s. towards the end of the month, reacted rapidly to 88*l.* 10s., but declined again to 86*l.* 10s., at which it closed. In Holland the opening prices were 56fl. for Billiton, and 57fl. for Banca. Our last mail advices quote Billiton 53¼fl., and Banca 54¼fl. The regular bi-monthly Banca sale, consisting of 22,100 slabs, went at 53¼fl., and the Billiton disposed of at the same time, amounting to 6700 slabs, brought 52⅝fl. The European deliveries are reported as 1700 tons in London (including 100 tons shipped to America), and 580 tons in Holland. The new shipments are reported as 1700 tons from the East Indies, and 1150 tons from Australia; 300 tons of the former and 50 tons of the latter being to the United States.

The continued increased production of the Straits, and the fear that the coming year will show the continuation in a still greater ratio, has allowed the "bears" to keep prices down, notwithstanding the increase in consumption and the decrease in the production of the Cornish mines, which is as sure to be continued as the increase in the Straits production is possible or probable. The "bear" phalanx has been admirably led throughout the year, and has been assisted by the demoralised state of mercantile affairs generally, and the timidity or stupidity of their opponents. The leading "bulls" have been vacillating throughout the fall, and apparently without wit or courage enough to seize the many advantageous openings made for them by small available stocks and large consumption. The meagre information concerning the capability of the Straits Settlements to produce tin, which has only become public as monthly shipments have been promulgated, certainly must have been and is as available to the leading "bulls" as to the "bears;" but it is barely possible that one party has been as ignorant on the subject as the other.

Notwithstanding the increased supplies from the Straits, consumption has more than kept pace with the aggregate supplies for Europe and America; hence the weakness of the leading "bulls" is the more lamentable in allowing the "bears" to force a decline of nearly 15*l.* per ton in about 12 months. Allowing that the shipments from the Straits and Australia to both Europe and America, also the supply of Billiton and Banca for 1883, will amount to about 36,000 tons, the combined deliveries will fully equal this, so that we shall have to commence the year 1884 with about the same visible supply as 1883, with the price much lower (unless we have a reaction in the meantime) and the market heavily "beared," stocks concentrated in very few hands, consumers holding almost nothing, either on spot or for future delivery.

As regards the supplies of 1884 there appears to be no reason to expect an increase except from the Straits; and allowing that we estimate this increase at 10 per cent. for 1884 over 1883, we are safe in predicting that this increase will be fully overcome by the decrease in the Cornish mines. The increase in consumption of America alone, which will need fully between 13,000 and 15,000 tons next year, or over 1100 tons per month on the average, will be an additional favourable feature. Tin-plates are in smaller supply in this country than probably ever before known, dealers and consumers holding small stocks, and the market for future delivery heavily "beared," notwithstanding the extremely low prices prevailing. Should the semi-panic caused by the reported future heavy supplies of tin from the Straits be replaced by confidence, because of sound reasoning on the part of those competent to judge of the probable total supply and demand, and their willingness to take advantage of the really sound position for 1884 in pig-tin, we shall see a startling rebound in prices that will carry dismay into the ranks of the "bears," who have by pure audacity and courage carried the day thus far against their weaker antagonists, who have had good statistics and a great decline in price for the year on their side. We look for a reaction, even without leaders. Prices not only of tin but all other staple articles have been unduly "beared," and the public at large are beginning to see their opportunity, and it is more than probable that the "bear" year of 1883 will give place to the "bull" year of 1884, and this change is not unlikely to commence before the end of the present month in all metals. Below we give the stocks on spot and afloat for Europe and America:—

	1883. Nov. 30.	1882. Nov. 30.	1881 Nov. 30.
Foreign tin in London ..... Tons	4,850	5,482	5,520
" afloat for London	3,717	2,180	1,700
Banca and Billiton in Holland	2,820	3,098	2,135
" " afloat for Holland	960	950	1,100
Total European stock	12,347	11,710	10,455
Spot stock in America	1,547	1,093	1,290
Afloat for America	843	1,720	1,445
Total visible supply	14,737	14,523	13,190
Price of Straits and Australian tin, New York	19c.	22⅛c.	22⅞c.
ditto ditto London	£86¼	£97½	£105½

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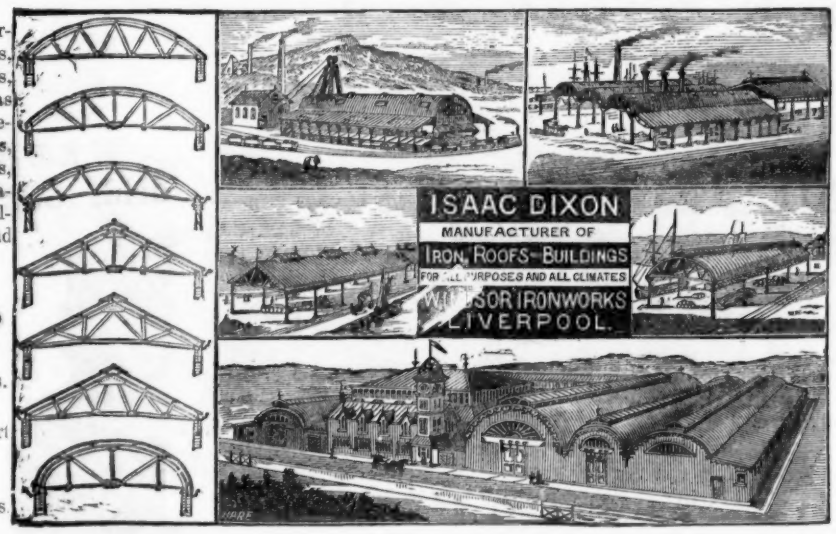

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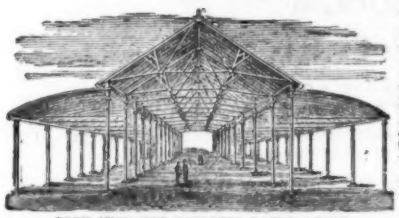

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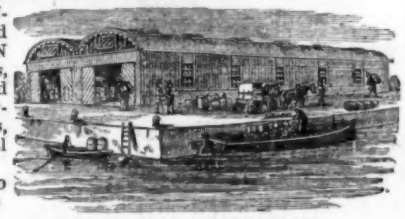

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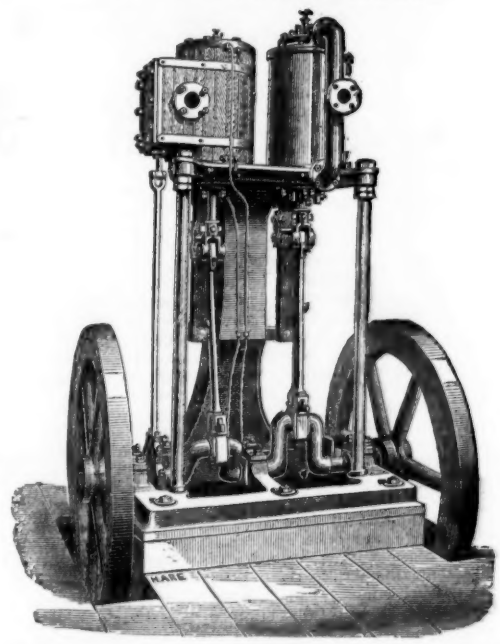

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NOTE

This volume has a very tight binding and while every effort has been made to reproduce the centres, force would result in damage